The PHOTOGRAPHIC JOURNAL of AMERICA

A Monthly Magazine Devoted to the Science and Art of Photography

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ASTRONOMICAL PHOTOGRAPHY

"These earthly godfathers of Heaven's lights,
That give a name to every fixed star,
Have no more profit of their shining nights
Than those that walk and wot not what they are."

WHETHER Biron was right or not in his cynical contempt of "star-gazing," men have pursued the study of the Heavens from a very early period; in fact, it is contemporaneous with the dawn of written history and probably antedates this. For many centuries, however, the observations were limited to the unassisted vision. The telescope came, which widened the knowledge greatly; then followed the spectroscope, which added a most interesting field of research. Probably the application of photography has been the most fertile means of increasing our knowledge of the sky. Just as the ocean depths have yielded to the camera, so the deeps of the firmament have steadily given up their secrets.

The announcement of Daguerre's discovery in 1839 lead to immediate suggestion of the possibility of obtaining photographs of the moon, but it seems that the first who succeeded in this work was J. W. Draper, of New York, who took a daguerreotype of it in 1840, and somewhat later made a similar picture of the spectrum; of course, not in colors. Some years after this Bond, of Cambridge, Mass., secured excellent moon photographs.

The earlier work was, of course, done with wet plates, and only limited results could be obtained with them. They have a limited range of color sensibility and are suitable only for comparatively short exposures. One of the most important advantages of the dry plate is its permanence, so that not only can it be exposed for hours, so as to get more impression, but it can be transported to any point and be ready for use at once. Many astronomical observations, especially solar eclipses, have to be examined in out-of-the-way places, where facilities for the use of wet plates are lacking. Moreover, the

wet plate must be developed promptly, while the so-called latent image on the dry plate remains for years.

The modern plate has a wider range of color sensibility than the human eye, and, hence, will record light rays that are invisible to us. The eye, also, is not as acute and fatigues easily, while the plate retains its sensitiveness as long as needed. As the sky has a motion, which, though only apparent, is a real obstacle to prolonged observation of any heavenly body, mechanical arrangements have to be made to keep the plate in motion in accurate rate with the objects to be photographed. Steadiness is also very important. These mechanical difficulties have been satisfactorily overcome and the modern observatory is equipped with very elaborate and efficient apparatus for direct photography and also for spectroscopic work.

The moon, of course, is the most striking object. Its disc is marked by many details, which are now known to be mostly mountains and plains. Vivid photographs of the whole disc and of portions of it are now among the most familiar illustrations in works on popular astronomy. In the days of the popularity of the stereoscope a picture of the full moon, made by Rutherford, was in almost every collection. This showed the globular form. It was really an optical trick. The moon is too far away for the distance between the eyes to indicate solidity, but making photographs a few hours apart, the rotation of the moon on its axis, or, at least, the slightly different position of it in regard to the observer, gave an appearance of solidity which was very striking. More detailed views, being made under higher powers, show only portions of the surface, and these are, in many cases, very peculiar. A large part of the satellite is covered with ring mountains, within which are one or more of peaks, closely resembling the old-fashioned sugar-loaf. The full moon makes the most striking picture, but for scientific purposes the crescent a few days old is more useful. Then the sunlight is seen glinting on mountain tops outside of the general illuminated areas.

Some interesting results have recently been obtained in photographing by the aid of ultra-violet and infra-red light only, that is, excluding the visible light. Professor Wood, of Johns Hopkins, has given much attention to this line. He employs a quartz lens, with a thin film of silver. This combination is practically opaque to all light below the extreme violet. By this method he found a peculiar appearance near one of the moon craters, which appearance he was able to imitate closely by photographing sulphur, so that it is possible that around this crater is a deposit of that material.

Photography has been much used for detecting the minute planets that are known as asteroids. These bodies circulate in orbits between Mars and Jupiter. Many of them are quite minute and of feeble light and are easily mistaken for stars, but their observed motion, not in the line of rising and setting (called "proper motion") shows them to be comparatively near. By exposing a photographic plate in a telescope equipped with machinery, which carries it uniformly with the rotation of the earth (equatorial movement), the fixed stars remain in the same relative place and appear as dots on the plate, while a

"CURIOSITY" HEYN STUDIO

"DOLORES" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

luminous object that has a motion independent of the earth's rotation will form a more or less defined streak. By this means many of the asteroids have been detected.

Although the moon is the most conspicuous object in the sky, its evident lack of activity and life has rendered it less interesting than some of the planets on which it may be possible that intelligent beings exist. The study of Mars, Jupiter and Venus, which are comparatively near to the earth and which show well-marked discs, has been an attractive field for the astronomer ever since telescopes have been known. Photography finds some application, but not as much as in other departments of sky-lore. The main reason for this is the very small size of the image in even large instruments, while much greater detail can be obtained with moderate telescopic power by viewing directly. The minute negatives do not permit of material enlargement, as the grain of the emulsion becomes too evident. By care and ingenuity, some interesting pictures have been obtained, but these are not, as a rule, informing. Mars is the planet which has been most extensively studied. It has an orbit somewhat like that of the earth, and its revolution around the sun and on its axis give interesting phenomena. The popular stories about the existence of intelligent beings on it have no foundation in fact. We are, at present, not able to affirm or deny the existence of such beings on any world but our own. Mars, however, exhibits one earth-like phenomenon. Its orbit and axial rotation causes a seasonal change, so that each half of it is alternately in the winter and summer position. Invariably, when one-half is in the winter position a white area spreads from the pole of that half down towards the equator, while in the summer position of this pole the white area shrinks and a corresponding increase of whiteness develops from the other pole. This has been assumed to be snow, but, of course, it may be some other material than water, that alternately freezes and thaws as snow does. The photographs of Mars show this so-called "snow line" clearly. The so-called "canals" of Mars are so far only indicated by drawings, and it is not sure that they are not, in part, at least, optical illusions.

The application of the spectroscope has been of great advantage in determining the nature of the heavenly bodies, and photography has been of much use in this line, especially as the photographic emulsions are sensitive to many rays that do not affect the human eye. Comets and meteors have also been photographed. Very impressive effects have been obtained by photographing nebulas, which are the cloud-like masses abundantly distributed in the sky and at immense distances. Double stars are very numerous, that is, stars that are companions, often so far away that the unaided eye sees them as one, but on examination it is found that they rotate around a common center of gravity, and, hence, are interrelated. Occasionally more than two stars are found in a group.

Astronomy, therefore, has found photography a great aid, both in investigating and recording celestial phenomena.

CONTROLLING GRADATION OF TONE— WILLIAM S. DAVIS

A KNOWLEDGE of how to secure with certainty a particular scale of tone is a most important asset to the photographer, since the successful representation of a subject—particularly the interpretation of some subtle quality of atmosphere or other delicate tonal effect—demands ability to work for a definite result.

Before intelligent control can be exercised it is necessary to understand both cause and effect, so the first point to consider is the factors involved.

The degree of contrast present in a subject is largely governed by the lighting, though the difference in tone and color of individual parts, of course, contribute their share to the result. The *direction* from which the subject is lighted determines the *proportion* of light and shadow the subject-matter is capable of showing, but once the angle of illumination is fixed the *degree of contrast* presented varies with the *concentration* and *intensity* of the source of light. For these reasons one must not confuse flatness with softness, as the first is caused primarily by the subject being illuminated from an unsuitable direction, while the latter is brought about by diffusion of light coming from the proper source. To make this point perfectly clear, let the reader imagine himself studying under differing conditions an ordinary landscape comprising, as the principal features, a grassy foreground and group of good-sized trees in full foliage in the middle distance. With the sun back of the observer the entire scene will be flooded with light on a clear day, the amount of shadow being reduced to small areas among recessed parts of the foliage, and in consequence the general effect is that of flatness. Visit the locality when the sun is well to one side and a full play of light and shadow will be seen in the foliage, and any inequalities in surface of the foreground will appear in an attractive series of minor tone gradation. Again, view the scene when the sun is back of the trees and a still greater amount of shadow will be visible, since not only the side of the trees toward the spectator are in shadow, but long ones from the trees are cast upon the foreground. Repetition of these visits at the same hours on a day, when the intensity of the sunshine is reduced by the presence of a thin haze or mist, will reveal the fact that, while the general arrangement of light and shadow is the same as before, the scale of contrast is much shorter, due to the lighter tones being less brilliant and the shadows grayer in quality. The weaker the light becomes the greater the difference in this respect, until on a dull, cloudy day the illumination is so diffused as to cause well-defined gradations of light and shadow to disappear entirely. The same effects can be demonstrated indoors by posing a model or still-life group so the light from a window strikes the subject from different directions; intensity of illumination being in this case altered by changing the distance between subject and window or covering the latter with semi-transparent material.

As so much depends upon proper illumination of a subject it is useless

to expect modification of the purely photographic technique of exposure and development to overcome mistakes of lighting but given an effect which looks agreeable to the eye, and there is no question that the amount of contrast shown in the finished photograph can be varied to a wide degree by straight methods of manipulation—the tone-scale being shortened or lengthened according to taste.

The length of the exposure and duration of development are the two most important factors in determining the general range of contrast shown in the negative, though in practice the nature of the sensitive emulsion, action of different ray-filters, and changes in composition of the developer, influence the result, but when using any selected combination of plate, filter and developer, the fact remains that the governing factors are exposure and development.

The length of the exposure determines the manner in which the proportional steps of tone are recorded, setting aside for the moment discrepancies due to unequal sensitiveness of the emulsion to different colors of the same tonal value. Theoretically correct exposure is that which reproduces accurately upon the film the relative position of each tone as it exists in the subject. Under- or over-exposure causes an unequal rendition of the tone-scale, the first sharpening contrast at the lighter end combined with failure to show differences of tonality in the shadows, while the second reduces the separation between each tone in the entire scale, thus shortening the range of contrast; this effect being most marked in the lighter passages.

"THE SOUL MATE" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

The action of any developer is to build up contrast as its action is prolonged—hence it follows that stopping development at an early stage produces a flat image, which, be it noted, may appear very thin or decidedly dense according to the amount of exposure the negative has received, for which reason it is a mistake to judge the printing quality wholly by the degree of opacity. While prolonging the time of development increases the scale of contrast up to a certain point, the limit is reached when the highest light in the subject becomes opaque. If development is continued beyond this stage, the next lighter tones will one after another become opaque, thus destroying the steps of gradation at the lighter end of the scale, and to this extent lessening the number of those remaining.

From the practical point of view the only tone gradations of value in a negative are those which can be reproduced in inverse ratio by the printing medium employed to produce the finished picture; consequently, it is proper to point out the fact that a print on paper cannot show as long an actual scale of tone which it is possible to record in a negative, for the reason that a transparent image, viewed by strong transmitted light, represents between the extremes of complete transparency and absolute opacity a greater degree of contrast than that presented by pure white and black upon paper, as the latter is, of necessity, seen only by the light reflected from the surface. For this reason

"THE TOREADOR PASSES BY" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

"THE TENNESSEE BELLE" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

"THE POWDER PUFF" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

it is necessary to keep the range of gradation in the negative within the limitation of the printing-medium to reproduce, which varies considerably with the process used. Bromide paper or the carbon process, for example, will render a longer scale of tones than the harder-working slow "gaslight" or developing-out papers.

In addition to the cumulative effect of time development upon contrast, further control is obtainable by changing the composition of the developing solution. The developing agents in common use may be roughly divided into two classes—those which bring out detail all over before sufficient printing strength is reached in the negative, and the kind which build up opacity simultaneously with the appearance of gradation. The first, of which metol is a typical example, are often known as high factor developers, because in timing development by the factorial method, the time of appearance of the high-lights must be multiplied to a greater extent to arrive at the total time the developer should be allowed to act than is the case with agents in the second class, like hydrochinone, which possess a low factor. Pyro stands by itself, as it possesses the properties of both classes, requiring a high factor when used in weak solution without bromide, while the reverse is true when the solution is concentrated and a considerable amount of bromide is added. Obviously, it is an advantage to employ a developer of the first class when a soft negative is wanted, especially when the subject possesses an excessive amount of contrast, since the ability to bring out detail in the shadows before full printing strength is reached allows one to stop the action at the desired stage without needless sacrifice of gradation in any part. Dilution of a developer also seems to assist in securing

"THE GARLAND" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

greater softness, as it allows ample time for even action to take place, but it should be understood that dilution, or the selection of a high factor agent, simply retards the building up of contrast; the result if pushed to the limit being similar to what is obtained with a low factor one, but it is of course necessary to develop to the limit. Increasing the normal amount of alkali, sodium or potassium carbonate, tends to bring out detail proportionately quicker than opacity, but with extremely sensitive emulsions, is liable to produce chemical fog. Potassium bromide should be omitted when the maximum amount of softness is wanted, or if its employment is absolutely needful to prevent the appearance of chemical fog in the brand of plate used, the amount should be reduced to the minimum.

The addition of a considerable amount of bromide before development is begun retards the first appearance of the image, and if development is continued a sufficient length of time increases the amount of contrast obtainable, but the greatest amount of control in this regard is secured by using such an agent as hydrochinone or pyro in strong solution, to which is added about one-fourth the amount of bromide as the weight of developing agent employed. The time of appearance is by this means much retarded, especially in the shadow portions of the subject; the opacity of the lighter tones building up slowly, but steadily, and if these appear to be gaining too much in proportion to the shadows, the partly developed negative can be transferred to a normal solution for finishing.

So far the element of color in the subject has not been dealt with, but as the majority of views exhibit colors to which the emulsion reacts in a different manner than their visual appearance might lead the uninitiated to suppose, it is necessary either to make allowance for their unequal actinic action or take means for overcoming it. As every camera user soon finds out, blue and violet exert almost as powerful an action upon a plain bromide of silver emulsion as white, being far more actinic than other colors of the same tone. Even color-sensitized plates are not free from this defect, but there is this important difference, the latter possess increased sensitiveness to yellow, light orange and yellow-green, in the case of an orthochromatized emulsion, and a panchromatic variety is even more sensitive to the colors just mentioned, besides possessing the ability to record deep orange and red. This being true, the only thing necessary for obtaining a balanced rendering of various colors is to retard the activity of the over-actinic ones, for which purpose a suitable color screen or ray-filter is used over, or back of, the lens. A yellow filter serves the purpose by converting the visual tint of blue to the less active green, and violet to a gray tone. The degree of correction obtained depends upon the depth of yellow and its spectroscopic quality, some shades being far more suitable than others, which is sufficient reason for purchasing filters only from reliable makers.

In practice, the advanced worker can make good use of several filters, ranging from a pale to a deep yellow, the first being used when but partial correction is desired, or only a limited increase in exposure is allowable, while the deepest is reserved for full, or even over, correction of the blue. A deep ray-

filter is at times helpful in controlling contrast when, as is quite often the case, the greater portion of the light tones are of a blue or violet tint, since retarding the action of these is then equivalent to shortening the photographic scale of contrast. The same means may be employed to deepen the tone, and clear up detail, in a distance obscured by blue haze. When, however, it is desired to accent the over-actinic colors, as for instance to exaggerate the effect of slight mistiness in distant parts of a landscape, a filter should not be used.

To sum up the foregoing observations, a normal result may be defined as one arrived at by timing the exposure to just record the deepest tone present in the subject by the time the high-lights in the negative have reached correct printing opacity in the course of development. Variations from the normal rendering may be obtained as follows:

To increase contrast. Give the minimum exposure which will register the deepest visible tone and extend development beyond the normal time. If still more contrast is wanted, use a concentrated developer containing an extra amount of bromide, preferably choosing a low factor developing agent.

To especially emphasize the high-lights, while suppressing gradation in the shadows, slightly underexpose, and stop development as soon as the light and middle-tones attain printing strength, thus leaving the shadows very thin in the negative.

To reduce contrast. Use a ray-filter, when such will assist, as previously noted, then if only a slight modification is needed, as in the case of a normally lighted subject, give full, but not over, exposure for the deepest parts and shorten the usual period of development. If more reduction of contrast is desired, use a dilute developer made up with a high factor agent and omit bromide. If still more softness of effect is called for, as in a harshly lighted subject showing very excessive contrasts, give several times the normal amount of exposure and develop to suit the lighter tones. By increasing exposure and reducing the length of development, a good deal of control can be exercised, but the rendering of the relative intensity of the tones will not be literally true to the subject, though from a pictorial viewpoint the effect may sometimes be better, notwithstanding.

ANTOINE FRANÇOIS JEAN CLAUDET

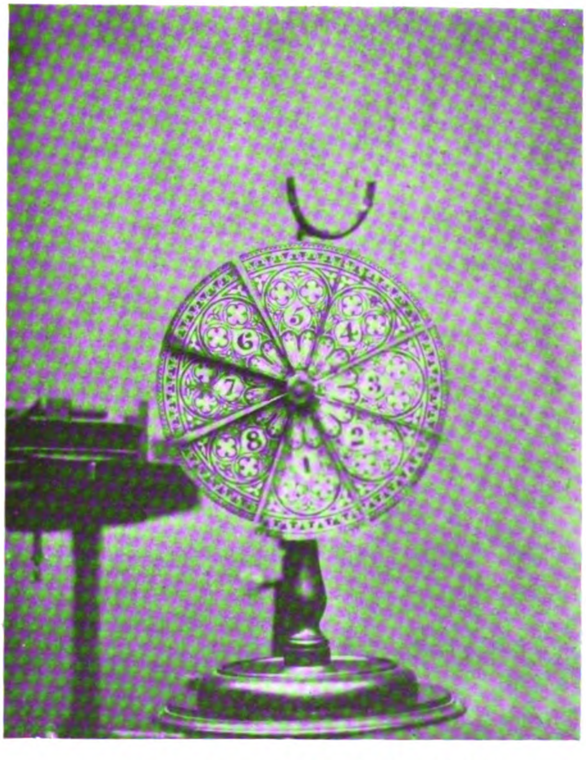
BACON says: "He that seeketh to be eminent amongst eminent men hath a great task"—and it is not better exemplified than in the scientific career of Antoine François Jean Claudet, a name not familiar with present-day photographers, but one which should ever be remembered for the earnest service to the art of photography in its infancy, associated as it is constantly with that small company of ingenious men, honored as the inaugurators of this wonderful art-science.

In the glow of enthusiasm at the ultimate realization of photography by Daguerre, men's eyes, for a time, were blinded to the credit due to the others, who were the pioneers, which made photography a practical accomplishment,

as well as to those compeers of the great inventor, like Claudet, who perfected the operation. We are too apt, nowadays, to imagine, from the suddenness with which the daguerrotype, in all its beauty, "took the world's great hands" that it sprang full equipped from Daguerre's brain like Athena from the head of Zeus. Not that we want to diminish in the least the honor which is Daguerre's particularly, but that we do not think it justice to let those of his day, who are equally worthy of honor, to be eclipsed by the great luminary. Among such worthy of honor is M. Claudet, and it is with conviction of his importance, both as a promoter of the scientific, as well as the artistic, phase of photography, that the memory of him should be made fresh to the present generation.

Fortunately, we are in position to do so through the kindness of his grandson, Mr. F. J. Claudet, who was attracted by a brief reference to his illustrious ancestor in connection with the subject of the diffusion lens, so much in evidence now in pictorial photography. Mr. Claudet has furnished us with interesting material and data for a brief sketch of some of the more important discoveries relative to photography by his grandparent. This we appreciate, not only as of great interest to ourselves, but of pertinent value to our readers, because they demonstrate the originality of thought which, in the record of a great man's labors, is always so potential in suggestion to investigators who follow.

Whatever M. Claudet did was pursued in a pure, scientific way of induc-



FOCIMETER—INVENTION OF ANTOINE CLAUDET

"VIRGINIA" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

"BACCHANTE" CHARLES H. DAVIS

From the One Man Show at The Camera Club, New York.

tion, and all the resources of chemistry and physics were called to his aid in substantiation of his theories.

Nor was practical application lost sight of, for he was most ingenious in mechanical application and, moreover, what is unusual in scientific minds, he was possessed of a fine artistic instinct, which was brought in play constantly.

Not only did he produce pictures of artistic value, but also put others in the way of artistic advance by his enthusiasm for the art value of photography. For instance, when M. Claudet discovered that the managers of the Universal Exhibition in London, 1862, had relegated photography as an exhibit to the mechanical section, he emerged from his scientific seclusion in the laboratory, lance in hand, as the champion for photography as a means of artistic expression, proclaiming that it is entitled to be regarded as much a fine art as any of the other fine arts.

"I am of those," he said, "who are convinced that the photograph deserves to be looked at as a work of art when it exhibits thought, artistic taste and refinement in expression, even though mechanical and chemical means may be necessary to produce it, instead of skill with pigment and brush. I consider that there is as much art possible with the results from the camera as there is in any of the fine arts."

AMBOISE, FRANCE, IN 1856

BY FRANK CLAUDET,
SON OF ANTOINE CLAUDET

Has not this the very touch of today? And yet it has taken half a century or more to convince reasonable people of the truth it embodies.

The first notable contribution to the progress of photography was given in a communication to the French Academy des Sciénces and to the Royal Society concerning a method of acceleration of the exposure of the daguerrotype plate.

M. Claudet demonstrated how bromide and chloride of iodine made possible the production of a satisfactory image in one-hundredth of the time necessary for the purpose with the plate as made according to old formula. This is certainly a great advance when we call to mind that it required several minutes in strong sunshine to get a good daguerreo image.

This discovery may be regarded as a potential germ which made ultimately the possibility of the moving picture. M. Claudet made a successful portrait by artificial light (oxyhydrogen) in 15 seconds.

The next problem to be undertaken was the determination of development by mercury vapor. He points out which rays have the greatest affect in influencing deposition of mercury on the exposed image, and what is the cause of the difference in action.

In the investigation of the nature and behavior of the achromatic lens, he shows the cause of the difference between the visual and chemical foci, and why

MOTHER OF ANTOINE CLAUDET (1857) ANTOINE CLAUDET

the variation and what are the means of measuring the action of the photo-genic rays to determine the true focus. One of the papers contributed to the Royal Society treated on the effect upon the sensitive surface of the different colored rays of the spectrum and the result of the transmission of light through colored media upon the plate—one of the steps which led to our orthochromatic photography.

He constructed the first practical actinometer. While on this subject, he sets opticians the problem of providing a lens in which the chemical and visual foci should be so associated as to give an image more approximating what is presented to normal vision.

His plan was submitted to M. Voigtländer, the leading optician of his day, but nothing was done in the line of his proposition until quite recently in the modern diffusion lens, so much in demand by pictorialists.

M. Claudet also associated with Sir David Brewster and Sir Charles Wheatstone in the perfection of the stereoscope, contributing materially to the improvement of the instrument and also in the construction of a binocular camera.

It would be impossible in such a sketch as this to do any justice to his

PORTRAIT (1860) ANTOINE CLAUDET

numerous contributions to photography or to the many mechanical devices he added to aid in manipulary facilities.

Sufficient, however, has been presented to show the impress he left upon the art in all its phases. His activity was incessant, his results invariably pregnant of much good.

It is said posterity is without gratitude! We avail ourselves of the earnest, untiring labors of those who are truly martyrs in the cause, because of their devotion. Without thought we make use of what has been secured only after hours of thought by painstaking investigation, with eye single for the benefit of their fellow-men to increase our pleasure of existence and administer to the higher principles of our being, but let us not forget the debt we owe to such men as M. Claudet.

He was one of Nature's noblemen—a true gentleman. He allowed his interest in science to overrule all meaner considerations, and with the noble sentiment of the philosopher, subdued all things to the purpose of investigating the recondite principles of Nature.

This was his adoration, the holy shrine where he brought his offering to humanity.

M. Antoine François Jean Claudet was born at Lyons, France, in 1797, and died in 1868.

UNKNOWN (1854) ANTOINE CLAUDET

SOME POINTS IN THE HISTORY OF COLOR PHOTOGRAPHY

COLOR is basis of the beauty of Nature. However impressive the snow-clad mountain may be or the broad expanse of ocean, the real stimulation is in the varied colors of the field and garden. Light, like sound, is purely subjective. If there were no ears to hear there would be no music; if there were no eyes to see there would be no color. Both perceptions are due to the translation of forms of energy through specially developed sense-organs. It has been debated as to whether the color-sense was always as highly developed in human beings as it is now among civilized peoples. Homer, who was very profuse in the use of adjectives, is said never to refer to the grass as green or the sky as blue, and doubts have been thrown on some renderings in the Old Testament. These suggestions have met with but little acceptance and need no further discussion. It seems certain that many of the lower animals have good appreciation of color, though how far they differentiate them is still not known. The comparatively rare, but definitely known cases of absolute color blindness in human beings are generally attended by a power of appreciating color differences by difference of shade, though confusing somewhat even such distinct colors as green and red.

LOUIS BLANC, FRENCH REVOLUTIONIST — ANTOINE CLAUDET

The nature of color was not elucidated until Newton showed that white light is a mixture of all colors appreciable by the human eye. Greek philosophers had surmised that the rainbow was due in some way to the action of raindrops, but being unfamiliar with the composition of light, could not explain the phenomenon. Newton thought that the power of bending the ray of light (refraction) and of separating the several colors (dispersion) are always proportionate and that achromatic lenses were unobtainable, but optical instruments with perfect color compensation are now everywhere familiar.

The sensitiveness of silver compounds to light was known to Glauber in the seventeenth century; in 1727, Schultz made some impressions by means of paper impregnated with a silver salt, and much later in that century Charles, a French investigator, made silhouettes by a similar method, but it was not until Daguerre made known his process that picture-making by automatic methods was possible, and no doubt the hope of securing the color, as well as the form, was suggested to many. Several facts unknown to Newton were discovered about the solar spectrum by which many valuable inventions have been made. Among these are: that the light of sun as we receive it is not complete, but lacks many tints, so that when properly examined it is interrupted by many dark lines; that rays invisible to the human eye exist beyond the spectrum in both directions, that is, below the red and above the violet; that the effect of the spectrum on silver salts (actinic effect) is not the same in all parts, the greater effect being in the violet and blue. Further, it was ascertained that three colors will produce by different mixture all others and also white light. These three colors are called "primary." Brewster thought that any three might be taken, but modern practice is to assume blue, green and yellowish red as the primaries, and it is upon this that modern color photography depends.

Among the first investigators to secure definite results along this line was J. C. Maxwell, who, in paper presented in 1860 to the Royal Society, and in a lecture on May 17, 1861, before the Royal Institution, gave elaborate accounts of the physics of the subject and also showed experiments which were probably the first productions of color photographs. At the lecture, Maxwell projected pictures which were combinations of photographs taken respectively through solutions of ferric thiocyanate (red), copper chloride (green) and an ammonio-copper salt (blue). At that time only the wet collodion plate was known, and as it is not appreciably sensitive below the green, Maxwell's pictures were not comprehensive enough in color range to give highly satisfactory results, but they were epoch-making in the field.

In the early part of the nineteenth century, Goethe wrote largely on the subject of color, and among other observations reported that he had obtained somewhat different tints with silver chloride exposed to different parts of the spectrum. His theories on the nature of light and color are now regarded as essentially erroneous. His statements are sometimes quite acrimonious in discussing the opinions of others.

As in most other departments of science, Maxwell's initiative did not lead to practical results until developments had been made in accessory fields, among

which was the production of materials sensitive to a much greater range of color than the wet collodion plate. In fact, the coal-tar industry was needed, for it was among the dyes produced in that industry that the substances were found which Vogel applied in extending the sensitiveness of the silver salts, and the orthochromatic and panchromatic plates, nowadays so familiar, are the result of his work.

The invention by Maddox of the rapid dry-plate was another important step. Moreover, Maxwell's solutions were but imperfect screens, not giving pure colors. By the use of coal-tar dyes, very accurate screens are now made, which, by means of spectroscopic control, can be made uniform in density and selective power. With such added facilities, the problem of obtaining photographs in natural colors was attacked by several investigators. An early inventor in this field was Frederick E. Ives. Employing the improved plates and carefully dyed screens, he was able to obtain striking and brilliant results. He employed the three-color system, and constructed an instrument for viewing the photographs directly, which he called the Kromskop, and also developed a triple lantern, by which colored pictures can be thrown on the screen. The lantern was capable of being separated so as to throw the three pictures side by side, thus neatly elucidating the principle of the apparatus.

These processes required a good deal of technical skill to secure real success and were expensive and cumbersome. Efforts were made to combine the screens on one plate, and so far it has been along this line that the best results have been obtained. Considerable ingenuity has been shown in making these screens, as the individual points of color must be quite small, or the illusion will not be produced. So far, the most successful system has been that of the Lumière Brothers, who brought out a screen made with small starch granules tinted blue, green and orange yellow, and distributed as far as possible equally over the plate. The only serious objection to this screen is its lack of transparency. Screens made by dyeing gelatin films with three colors in dots, square or round, have been offered, some of which are very transparent and serve very well for lantern slides, but under high magnification the details of the screen are seen, and all the color illusion is destroyed, for the effect depends on the eye being unable to isolate the individual colors, which are then fused into one perception, somewhat as the rapid succession of pictures give the impression of motion, although each picture is really at rest. The Thames and the Dufay plates, which were on the market for a while, were both dyed screens and gave good pictures, but neither is now obtainable. Some years ago, the Paget color process was put on the market. This is a dyed-screen method, but differs from most others, in that the screen is separate from the sensitive plate. A "taking" screen is placed in front of the emulsion and is removed when the exposure has been made. The plate is then developed and a positive made, which is placed under a "viewing" screen that must remain permanently attached. To get the proper effect, the viewing screen must be adjusted exactly as the taking screen was, a procedure which requires a good deal of skill. The plate used in taking the picture must be panchromatic, but that used for the positive need not be.

Some years ago a process of color photography, by means of prisms, was exhibited at a meeting of the Royal Photographic Society, and the details published in the *Photographic Journal,* but while very ingenious and stated to be successful, it has not come into practical use.

At the present time the Lumière plate is probably the most used, and in the hands of skilful workers, interesting and valuable results can be obtained. The earlier plates furnished by the Lumière Company were rather delicate, the film often slipping, but the later products are better and the margin of time for using them has been extended.

The process of the late Gabriel Lippmann depended on optical principles entirely different from those described. It was announced before the French Academy in 1891, and good results were shown, but has never found commercial introduction.

All the ordinary procedures of color photography are in the nature of optical illusions. The true method will be to produce an emulsion which will respond to each color by its inherent property, so that either directly, or by the development of the so-called latent image, the colors will appear in the true value. This may seem impossible, but human ingenuity seems to know no bounds, and the "patient search and vigil long" of the earnest workers may bring out such a procedure in time.

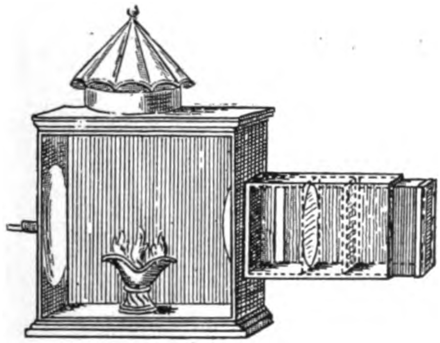
Meanwhile, credit must be given to the many investigators who have labored so faithfully in perfecting the methods now available, which have certainly given the world some very satisfactory and ingenious applications of photography.

One question always arising when color photographs are under discussion is whether they are truly artistic. The question was the subject of a short essay in the issue of this JOURNAL for September last. Opinion will be largely influenced by what one regards as true art and how far one's tendency is towards realism or away from it. In many cases, color photography is garish, the color values are not observed as they would be by the painter, for they are not under full control. To many persons the monotone picture, taken with a plate of wide range of color sensibility and through a suitable screen, is more pleasing. An unconscious allowance is made for the translation into the gradations of the dark and light portions of the view. Autochromes often show a distinct bluish tint, due to the effect of light of the sky upon the panchromatic emulsion; this can generally be eliminated by suitable screens, but in dealing with landscape under varying conditions of illuminations it is difficult to secure the proper balance. In some fields, as in the reproduction of polarized light effects, such as obtained with rock sections, the color photograph shows excellently, because there is here no question of art or color value, but of sharp contrast and brilliancy.

INFANCY OF THE OPTICAL LANTERN—W. L. F. WASTELL

WE who are accustomed to be hypercritical at a display of photographic slides, to say nothing of kinematograph films, may well be surprised at the primitive arrangements that satisfied people only a generation or so ago. In a book dated 1794 is an account of the production of a home-made magic lantern and of the slides therefor, from which it may be interesting to quote.

"This very remarkable machine, which is now known over all the world, caused great astonishment at its origin. It is still beheld with pleasing admiration, and the spectator very frequently contents himself with wondering at its effects, without endeavoring to investigate their cause. The invention of this ingenious illusion is attributed to the celebrated P. Kircher. The design of this machine is to represent at large, on a cloth or board, placed in the dark, the image of small objects, painted with transparent colors on plates of glass."



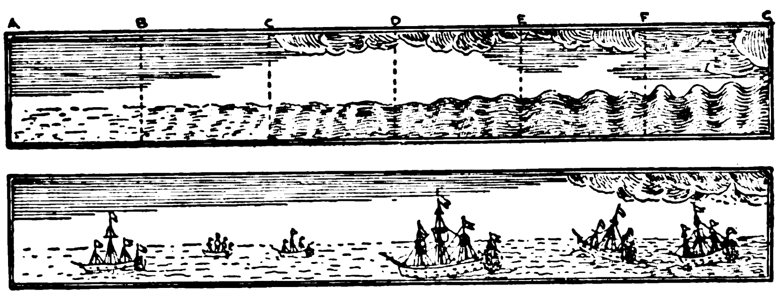
The copy of the illustration provided shows the construction of the lantern, which is made of tin, as is also the oil lamp with its three or more wicks, and the very necessary chimney for the escape of the smoke. At the back is a concave mirror, which can be moved backwards and forwards by means of a rod in a socket. At the front is a convex glass to act as a condenser. Outside the front is attached a sort of box without ends, with slots for pushing the slides through. Into this are telescoped two other boxes, each carrying a single lens, with a cardboard diaphragm between them. By sliding these boxes the focus of the lens system can be altered.

Instructions are given for printing the subjects on strips of glass fifteen inches by three. "Observe, in particular, not to use more than four or five colors, such as blue, red, green, and yellow. You should employ, however, a great variety of tints, to give your paintings a more natural air, without which they will represent vulgar objects, which are by no means the more pleasing because they are gaudy. When the lamp in the lantern is lighted, the figures painted on the glass appear bright and well defined, and the spectator cannot

fail of being entertained by the succession of natural or grotesque figures that are painted on the glasses." It is explained how the spectators may be still more "entertained" by using two slides at once, and an example is described and illustrated.

"On one of these glasses you are to paint the appearance of the sea, from the slightest agitation to the most violent commotion. Representing from A to B a calm; from B to C a small agitation, with some clouds; and so on to F and G, which should exhibit a furious storm. Observe that these representations are not to be distinct, but run into each other, that they may form a natural gradation; remember, also, that a great part of the effects depends on the perfection of the painting, and the picturesque appearance of the design." (For which, see illustration.)

"On the other glass you are to paint vessels of different forms and dimensions, and in different directions, together with the appearance of clouds in the tempestuous parts. You are then to pass the glass slowly through the groove, and when you come to that part where the storm begins, you are to move the glass gently up and down, which will give it the appearance of a sea that begins



to be agitated; and so increase the motion till you come to the height of the storm. At the same time, you are to introduce the other glass with the ships, and moving that in like manner, you will have a natural representation of the sea and of ships in a calm and in a storm. As you draw the glasses slowly back, the tempest will seem to subside, the sky grow clear, and the ships glide gently over the waves." (A blind eye must be turned to the fact that the ships will be gliding gently stern first.)

"By means of two glasses disposed in this manner you may likewise represent a battle, or sea fight, and numberless other subjects. They may be also made to represent some remarkable or ludicrous action between different persons, and many other amusements that a lively imagination will easily suggest, the instance we give here being intended merely as an example, and to show that this machine is capable of producing much more remarkable effects than have hitherto been exhibited."

Taking all the circumstances into account, it is doubtful whether anything more remarkable has been exhibited since.—*The Amateur Photographer and Photography.*

USE AND ABUSE OF SHADOW

A PHOTOGRAPH is essentially a reproduction of Nature in monochrome, and the skill of the photographic artist is conditioned by his ability to translate the varied tones in terms which suggest to our vision the nuances or infinite gradations of Nature's coloring. That is, the artist must successfully imitate the values presented, not only by the individuality of definite tints, but must, at the same time, preserve their relativity in the scheme of lightness and darkness.

Now this, we venture to say, despite what the enthusiasts for color photography maintain, is more effectually secured by masterly management in monochrome than by any other method of photography, particularly so when the monochrome artist avails himself of the resources afforded by the orthochromatic method of photography, which is doing yeoman service in overcoming the impediments incident upon the practice of the old process.

While applauding the efforts of experimenters in color reproduction and possessed of the ardent belief that a true color scheme of photograph will eventually be attained, at present we pin our faith upon the ability of the ever-improving method of orthochromatism to give the artist facility to correctly translate in monochrome the glories of Nature.

We do not think that the pronouncement will be challenged, by even the autochrome photographer, that a good photograph in black and white better suggests the colors of the original, natural subject than a poorly painted picture of the same or the average color photograph. This does not imply that we do not appreciate the few true-to-Nature autochromes, but the paucity of good artistic results in this direction rather fortifies our predilection for the beautiful monochrome.

The difficulty is increased when the photo-artist essays to employ in his picture a preponderance of shadow. This is particularly manifest in portraiture where the photographer has in his power the control of his light for his personal inclination in manipulating to effect.

Take, for instance, the case where the shadow side of the face is the feature in his portraiture, the so-called or mis-called Rembrandt effect. In most of the portraits of this character there is shown a lack of transparency in the shadows, which suggests nothing of color in the monochrome of which it is supposed to be a translation.

Now this transparency or luminousness of shadow is the prime factor in a good work. There is shadow to be sure, if by the term is to be understood blank undifferentiated dark, which is never seen in Nature, where there is always adumbration.

In the Rembrandt pseudo-shadow there is nothing but flatness, nothing atmospheric, no depth to it and the whole portrait in consequence is without vigor of tone or any of the qualities which give artistic suggestion of relief upon a plain surface.

Get in the portrait this luminosity of shadow and you will find that at the

same time you have softness and gradation of density in the high-lights of the portrait. The relativity of tone in the picture will thus be secured.

Examine a portrait by some eminent portrait painter for this luminosity of shadow and you understand the character and the part it plays in the picture quicker and better than can be given by verbal description. Or look at the fine heads by masters in portraiture with the camera. The source is in the character of the illumination employed. In manipulating the light have an eye single for the effect it produces on the shadow.

The luminous shadow helps, too, in securing the individuality of the model, in preserving the characteristic likeness in giving expression to the portrait. The brilliancy of the high-lights and their relativity in tone is due almost entirely to the contrasts with the darks, not to their excessive forced whiteness by over-intensity. True, we do see in portraits by great painters contrast marked by opposition, but it takes a consummate master to produce brilliancy by marked opposition of dark and light tones, but the photographer, even if skilled, is most prone to get harshness and exaggeration of contrast. Where preference is given to the shadow-side presentation of the face (a presentation not to be indiscriminately indulged in because the spectator's interest is, perforce, there specially attracted), the photo-artist must particularly study to affect this luminosity or the spectator is disappointed by perceiving a smudge where he looked to find soft gradation.

It is well within the power of any ordinary photographer, capable of appreciation of tone value, by exercise of that appreciation to get, by study of his scheme of illumination, considerable shadow in his work without danger of plunging into the whirlpool of smudge.

If you photograph a head with the light directly in front you know that, despite the initial beauty of the subject, what is the result—"flat, tame and unprofitable," and you get just as bad results when you give monopoly of shadow—unless you have the genius of a Rembrandt, and if you had, you are denied the resources Rembrandt called to aid.

To get luminous shadow you must make use of pure, strong light, but it must not come on with a flare, but be admitted through a small area. The shadows are never over-strong when there is perfect modeling, and then you, too, are assured of softness in high-lights, because harmony of relation is secured.

There is danger attendant with the use of weak initial light, because the half-shadows are lost and no connection established between extremes of light and dark. We must have the middle tones to get the artistic relief. A face properly shaded should seem to emerge softly from the background, not look as if it were on a rush, distinct from the ground, but not with sharply defined outline against it.

Sometimes, even parts of the outline, projected against the background, might advantageously merge into the ground. So, you see, that while shadow effect is a potent means for expression, it becomes a dangerous agent when not artistically controlled.

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Diffusion of Light Preferable to Reflectors in Portraiture

It has been the observation of many artistic portraitists that the reflector used to light up the shadows of the face in a portrait is frequently abused, and that its employment, if it is employed at all, should be with great caution and with application of judgment. Some, indeed, go to the extent of banishing the reflector altogether and get natural artistic effects solely by proper diffusion of the light.

A truly modeled portrait consists of two parts, one light and one shade with their respective intermediate gradations and mutual blendings. How useless to attempt to produce these by a combination of conflicting lights and shades, the lights coming from different sources and falling upon different parts of the model, so that the parts of the picture which should recede into deepest shadow are interfered with and broken up by counter-reflections to the entire destruction of the very aim and object of correct lighting which is artistic contrast.

Diffusion should take the place of reflection. Every one who has taken an artistic landscape knows that such is Nature's method of softening her contrasts.

How beautifully soft, yet glowing, is the view of a building made on one of those fortunate days (photographically) when the sun is just beginning to be veiled by light fleecy clouds and all the air is filled with a soft imperceptible mist.

To imitate this feature in our portraiture is not a very difficult thing, if we bear in mind the principle involved, namely: diffuse the greater part of the upper and side lights by means of some suitable gauzy material and allow the uncovered portion of the glass to give the intense light. Of course, the position of the model with relation to the scheme of illumination must be studied out, the size and height of the light from the subject, etc., but you are not supposed here to be a novice in the art. Production of high art cannot be attained by the novice in the giving of a few ready-made maxims; fortunately, too, it cannot.

A large light, at a moderate distance from the floor or platform, where the model is placed, in connection with a low side light, is the easiest to manage. Such a light, properly screened and worked intelligently, will need no aid of the reflecting screen. It gives soft and beautiful modeling. A low light of smaller dimensions will give the same results, only somewhat bolder, and by reducing the extent of intense light (our clear glass surface) in the latter case and increasing it in the former the effects may be made precisely similar.

A large light is preferable, of course, since it is much easier to reduce the superfluous shadows and contrast, but on general principles the area of dominant light should not be too extensive or there is a liability of destroying the luminosity of the shadows, which gives the pleasing roundness and artistic relief which is a valuable asset pictorially.

The Manufacture of Synthetic Chemicals in the United States

Research in organic chemistry is largely dependent on a supply of synthetic substances, not very complex in composition, from which the more complicated derivatives are built up. Many tests also require special substances which are not found ready formed in nature. Up to the outbreak of the war, Germany was practically the only source of these compounds, hundreds of them finding their way into the laboratories of the rest of the world. War conditions deprived the United States of this supply, and efforts began promptly to develop a domestic industry. The Eastman Kodak Company has been carrying out such work on a comprehensive scale, and has succeeded in preparing a large number of important synthetics, and thus placing American chemists in a more satisfactory condition than when dependent on foreign sources, for it must be borne in mind that even if the foreign supply is available, there is great advantage in being able to obtain materials from points near at hand, as against several weeks' delay which is usual with shipments from abroad.

In a lecture delivered before the Society of Chemical Industry at Montreal, Messrs. Mees and Clarke present many of the details of the work carried out in the E. K. C. laboratories. They point out that the first step in the direction of furnishing American-made synthetics was under the direction of Professor Derick, of the University of Illinois, who invited a number of the more promising students to work during the summer, in making the chemicals most urgently needed in the departments of the university. The work was still further extended in 1917 by Professor Adams, who had succeeded Professor Derick, but the resources of the laboratories were not adequate, and in 1918 the Eastman Company entered the field. Difficulties had arisen in the meanwhile, among which was the increased cost of raw materials and diversion of many trained chemists to government employ.

The paper of Messrs. Mees and Clarke has been printed as an illustrated pamphlet, which gives a vivid and interesting picture of the work at Rochester.

Proposed Centennial of Photography

Recently a suggestion has been made in France to celebrate, in 1922, the centennial of the invention of photography. As the semi-centennial was celebrated with some pomp in 1889, the question at once arises as to what has become of the seventeen years still to elapse before the full hundred is complete. The answer is that the celebration in 1889 was of Daguerre's invention, 1839 being the year in which Arago made public at a meeting of the Academy of Sciences the details of the method, which had been used by Daguerre for some time previous. The proposition now made is to go back to Nicephore Niépce's work, which is claimed as the really first step in actual photographic procedure. G. Potonniee, who is promoting the view, is rather severe on the efforts made in other countries to deprive France of the honors of invention and discoveries in the field of photography. He says that in this field the documents are all at hand and clear in their indications, hence there should be no dispute as to the original source. "Of what invention," he asks, "is the origin better known than of the kinetograph?" The records are contemporaneous, the dates are all ascertainable, and the brothers Lumière are prepared to answer all queries. Notwithstanding this, the recent death of Greene, he tells us, has given occasion for England to claim this invention, and America has given the honors to Edison. The French writer is evidently ignorant or indifferent to the actual records. Well-established data show that while the brothers Lumière are entitled to great credit for developing a high-grade motion-picture film and machinery, they worked as all other inventors and discoverers do upon information obtained by earlier laborers in the particular field. It was shown in the issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA for May last that the development of the motion picture as a practical method was gradual and that several Philadelphians had a large share as pioneers.

The French writer is especially severe on Germany, stating that in spite of the fact that every one knows that no contribution to the original work came from beyond the Rhine, claims are made for such discovery. Here again we have evidence of a narrow view, for Schiendl, in his "*Geschichte der Photographie*," reviewing the early history, says that if it is merely a question of producing effects by light, the honor must go to J. H. Schulze, who in 1727 observed the darkening of a silver salt and used the action to secure a white line on a dark ground by covering a portion of the sensitive salt with an opaque band. He adds, further, that if the question is who first made pictures of permanent value, the honor will go to Niépce. Niépce used bituminous materials which are rendered less soluble by light, and in 1824 made a picture which is (or was) preserved in the museum at Chalon sur Saone. This picture was made by coating a polished plate with a solution of bitumen of Judea in Dippel's oil, and after it was dry, covering it with an engraving that had been rendered transparent. The combination was exposed to light and treated with solvent materials by which the portion not acted on by the light was removed.

Niépce was for a considerable time associated with Daguerre. A fair examination of the data at hand shows that many workers of different nations contributed to accumulating the practical and theoretical data upon which the development of photography depends, but it seems that the first person to produce a permanent picture from nature was Niépce. Whether sufficient enthusiasm can be awakened to make a successful centennial celebration is a question that need not be discussed here, but enough has been quoted from the German work to show that Potonniee's charge against Germany cannot be sustained.

Application of the Mount Pictorially

In the ordinary affairs of life we can know nothing in itself. We know things only as related to other things. We judge altogether by comparison; for instance, we have no fundamental idea of the actual size of an object, unless we have, by way of comparison, something known to be of a definite size; and this is true of secondary qualities of things, such as color, light and shade.

The lightness of tone of a certain object, which we appraise as light in tone, may be made to appear comparatively dark when placed in relation with the tone of some object which is higher than it in key.

A piece of gray paper, for instance, placed in the full blaze of the noonday sun, is nearer white than a piece of the whitest possible paper seen in a dark corner of a room.

If we hold up the whitest of white things against a bright sky it looks almost black.

This experience of vision is due to the peculiar physiological behavior of our vision.

Now, why all this preliminary talk, when the subject is about mounts for photographs?

Simply because the confusion of judgment we spoke about above, when estimating values, is really a factor of importance to be considered when we come to mount a picture, so as to best bring out its excellent features. More, too, because it is a factor confusing or misleading, when we come to exercise our taste in selection of the mount.

This physiological effect takes place when we place together contrarities of light and shade and differences in tones of color—a performance taking place when we mount a photograph on a card. First, let us show how an object of a certain light tint invariably appears darker in tone when placed alongside a tint much lighter than it.

If we take a small disk of paper, say ½ inch in diameter, of a medium gray, and lay it down, first on a strip of paper which is lighter than it, we note that it is of a darker hue than another disk of the exact color cut from the same sheet and laid on a strip of paper darker than the disk.

The effect in each case is so strikingly different that it is impossible to realize that the two pieces are identical in color, until both are placed simultaneously upon the same color background.

Now this radical change produced by simultaneous contrast is precisely what takes place when the photographer mounts a picture of a certain tone upon a card which causes this contrast effect.

Do you not see how the tone color of the mount must have effect upon the tone of the photograph?

Furthermore, this effect operates in an unexpected way by its influence upon the æsthetic values of the picture. Not merely is the photographic tone altered, but there is a concomitant action.

The tone of a photograph varies in depth or intensity.

Take, for instance, a landscape with distant mountains of a certain degree of intensity which produces a fine aerial perspective effect, a nice suggestion of atmosphere. Now suppose you mount such a view upon a white card and you at once establish the conditions of simultaneous contrast and instead of preserving the delicate grays of the distance they are brought out stronger because of the effect upon the eye of the juxtaposition of the tones simultaneously.

So it follows that, according to the tone of the mount, the tone of the distant planes may be heightened or diminished—to approach the vision or recede.

Therefore, it may be safely affirmed that the color-tone of the mount may not be left to the mere selection of what pleases our taste as to the mount itself, but to the artistic effect desired.

The Gorsky Process of Color Cinematography

[A recent patent specification (British No. 168,100), describes the method of preparing three-color films for cinematograph projection, which presumably forms the basis of the system of preparing ready-to-show cinema films which is being worked out in England by Professor de Procoudine-Gorsky. As will be seen from the following extracts from the specification, the process chiefly consists in the production of superimposed color impressions of yellow, red and blue colors, the two former by a process of dye-mordanting and the latter by chemical toning.—Eds. "Color Photography" Supplement in the British Journal of Photography.]

This invention is more particularly applicable to and will be described with reference to the process in which a cinematograph negative is taken through a recurring set of color filters, thereby obtaining a recurring series of color-record negatives on one film. The three positives are produced by

printing in turn from the three different series of color records, and in printing each positive, the negative is stepped the extent of three pictures at each shift.

The invention primarily consists in a process for the production of such fully colored positive images from the corresponding negatives, in which the positive images from the negatives of violet-blue sensation are colored yellow by means of a solution of basic auramine in the presence of basic aluminium acetate, the presence of the latter distinguishing the process from prior processes in which auramine is used either in the presence of acetic acid or in other ways.

The invention further consists in a process as set forth in the preceding paragraph in which the positive images from the negative of green sensation are colored red by means of a solution of rhodamine in the presence of acetic acid, and the positive images from the negative images of yellow sensation are toned or colored blue by means of a solution of potassium ferricyanide and ammonia immersed in solutions of ferric chloride and sodium thiosulphate, and finally in sulphuric acid.

The invention also consists in a process as set forth in the two preceding paragraphs, in which the respective negative images have been taken through light-filters of methyl-violet 6B, brilliant green and Bengal rose, the ultra-violet rays being eliminated.

The invention also consists in a process as set forth in the three preceding paragraphs, in which the use of a protective stratum between the component positives is avoided by treating the layer of gelatin bearing the image with a hardening solution, well washing, and then coating the next layer of sensitive emulsion without drying.

In carrying the invention into effect, a negative emulsion is panchromatized by treatment with ethyl red in the manner described by Professor Miethe, in order to obtain an emulsion having a practical equality of sensitivity to the red, orange, yellow and green rays of the solar spectrum. The negative emulsion (that is, the negative film) is exposed by means of a cinematograph camera fitted with the requisite light-filters, and capable of working at a speed of forty-eight or more pictures per second for prolonged periods. The three light-filters are carefully chosen, and are preferably of methyl-violet 6B, brilliant green, and Bengal rose. The first light-filter passes all the red, orange and yellow rays; the second, all rays having a wave length of 500—600 $\mu\mu$, that is, the green part of the spectrum, the third light-filter passes the rest of the solar spectrum, that is, the blue, indigo and violet rays, and also the ultra-violet rays.

A sufficient quantity of tartrazine is added to the Bengal rose and brilliant green filters to absorb the blue, indigo and violet rays. An aesculine screen is used in conjunction with the methyl-violet 6B filter, in order to absorb the ultra-violet rays. The aesculine, however, must be very pure, and be of the kind produced by Dr. E. König.

The exposed negative film is developed, fixed and washed, after which a positive is made in the following manner: From the negative film the pictures first printed upon the positive film are those exposed through the violet blue light-filter. The printing machine is adapted in such manner that the print of every successive image of like color-sensation on the negative film, which is separated by images of other color sensations, is printed on the positive film in a contiguous and successive series of images of like color-sensations. When the positive film has received images of like color sensation, has been developed in the usual manner, and dried, it has to be of the complementary color to the light-filter through which the negative image was taken. That is to say, the positive images from negatives exposed under the violet-blue filter must be colored yellow; those positive images from negatives exposed under the red or orange filter must be colored blue, and those positive images from negatives exposed under the green filter must be colored red.

In the present instance the positive image of violet-blue color-sensation having been made first, the positive film is to be colored yellow. It is immersed in a solution of potassium ferricyanide to which has been added a solution of potassium iodide and ammonium hydrate. Upon immersion in this solution the metallic silver of the image is converted partly into silver iodide and partly into silver ferrocyanide. About three minutes is the average time required for this operation. The film is now washed for about five minutes in running water, and then dipped into a solution of basic auramine in the presence of acetic acid and basic aluminium acetate. The solution of the latter salt should be freshly prepared, as it is of the greatest importance for the purpose of obtaining a lake-like substance. Basic auramine, if used in the manner already described, does not lose depth of tone in color when being washed, and gives a correct color rendering. The use of this dye

in the foregoing manner involves the formation of a lake-like substance formed by the action of basic auramine on silver iodide and silver ferrocyanide, which is "fixed" in the presence of basic aluminium acetate. The process takes about five to eight minutes, according to the density of the image.

By means of a second washing in running water the superfluous dye is removed, while the greater part of the silver iodide becomes transformed into a lake-like substance; but experience shows that in this process a certain part of the silver iodide remains unchanged, causing an opalescence of the image and does not enter into the formation of the lake-like substance. For the purpose of the present invention all clear parts of the gelatin should be absolutely transparent, and the dye used must be totally removed by the washing. The positive film is further washed in a solution of tannin and glycerin, whereby the whole gelatin coating is tanned by the tannin and the glycerin renders the layer supple, the latter being of importance during the subsequent manipulation of the film. The operation takes about five minutes. The positive film is then transferred into a fixing solution, which removes the small remaining quantity of silver iodide which is not converted into a lake-like substance, and makes the film absolutely transparent; the image remaining a golden yellow color. The fixing solution comprises sodium thiosulphate in the presence of some of the tanning solution (that which adheres to the film), as experience shows that the presence of the latter solution causes the fixing to proceed more equally. The film is now washed and dried.

The colored positive image may now be hardened by treatment with potash alum, chrome alum, formaline or other hardening solutions, well washed to eliminate the hardening solution, and coated directly with the next sensitive emulsion without the drying of the treated gelatin coating, but it is very important that the hardening substance should be washed away as far as possible so that it may not have any influence on the lake-like substance of the image or the following coatings of the sensitive emulsion. Alternatively the emulsion may be covered with a gelatin solution to which has been added a small proportion of a hardening solution, dried, and then coated with the next layer of emulsion. If desired, however, the colored positive film may be protected when necessary from any subsequent chemical manipulations by coating the emulsion side with a protective stratum comprising a very thin but solid layer of a 1 per cent. solution of rubber in benzol. Following this, the emulsion side of the positive film is coated with a solution of celluloid in acetone. A very thin layer which resists any of the applied solutions may be obtained by spraying the solutions on to the positive film by means of an aerograph. When a protective stratum is used it has been found absolutely necessary to use coatings of both solutions, as if only one of them is applied the coating is permeable even in thick layers.

Following the protective or hardening of the yellow-colored positive images, the positive film is now coated on the same side by machinery with a positive emulsion containing a sufficient quantity of silver bromide for the formation of a lake-like colored image. The negative images taken through the green light-filter are now printed upon the positive film by means of a printing machine adapted as already described. The manipulation of the positive film is now similar to that described with reference to the positive images printed from the negatives of violet-blue color sensation, the difference being that rhodamine is used in the presence of acetic acid to obtain the red-colored component.

The printing of the negative images taken through the Bengal rose filter is the last printing operation to be carried out by the printing machine, the impression of the images being made upon the coating of the positive emulsion directly coated upon the hardened red-colored images, or upon a coating isolated therefrom by means of a protective stratum. The images so obtained are then colored or toned blue by a solution of potassium ferricyanide and ammonia, washed in running water, immersed in a solution of ferric chloride, immersed in a solution of sodium thiosulphate and finally immersed in dilute sulphuric acid. After washing and drying, the positive film receives a final protective coating of rubber and celluloid.

From the foregoing it will be observed that the present process affords an exceedingly thin and transparent film, which does not scale under the action of heat, and which may be projected on to the screen from standard cinematograph apparatus at the normal speed of 16 pictures per second.

A Price Reduction.

Due to a new postal ruling, no extra charge will be made for foreign postage. The price of a year's subscriptian to THE PHOTOGRAPHIC JOURNAL OF AMERICA is $2 per year the world over.

Pictorial Photographers of America

The regular meeting of the Pictorial Photographers of America took place on December 5th in the large assembly room of the new Art Center, 65 East 56th Street, New York. A large number of members were present. Mr. Jerry D. Drew presided and told us a lot of good things about the coming 1922 Annual, which edition even is hoped to surpass the large sale of this year's book. The subject of the evening was "Winter Scenes and Marines." There was a large exhibit of members' work upon the walls appropriately illustrating these two subjects. We were very fortunate in obtaining as the speaker of the evening Mr. William H. Zerbe, the well-known photographic authority, who gave us a very interesting and valuable talk upon snow pictures and marine work, incidentally bringing in many anecdotes connected with his vocation as a staff photographer on one of our city's large dailies. New members are coming in rapidly and, all in all, our society is in excellent shape.—K.

Toning by Tin Salts

Formstecher, in a recent issue of *Photographische Rundschau*, presents a somewhat lengthy paper on this subject. The first employment seems to have been by a German experimenter in 1910, who deemed the method especially applicable to gelatino-bromide emulsions. His procedure, though satisfactory, did not get into general use, but two years later Desalmes worked with it and afterwards Namias. At the beginning of the war the process had again fallen into neglect, but in 1920, Pokorny revived interest in it, although his methods are not satisfactory.

The process rests on the principles of colloid chemistry. In contrast to the ordinary methods of toning, in which the silver is either replaced or converted into a new compound, the action of the tin salt is to produce a metallic silver in exceedingly fine division, associated with tin dioxide (stannic oxide) also in fine division. This association is of the type now termed "colloidal complexes," and the action is considered to be "adsorption" and not "absorption." An analogous gold complex has been long known under the name of "Purple of Cassius." This is produced when a solution of gold chloride is mixed with tin dichloride (stannous chloride). A purple precipitate is formed, which was first obtained by Andrew Cassius, a Dutch physician, about 1685, and was used for coloring glass.

Ordinarily, these colloidal metallic precipitates will pass readily into granular masses, but in the case in hand, the colloidal tin oxide protects the metal, constituting what is known as the "protecting colloid." For this reason the warm tones (brown to red) that are produced by the method are permanent.

In toning with tin salts, the first step is to bleach the image; that is, to convert the silver into a colorless and somewhat soluble silver salt. Several methods of bleaching are available and are about equally satisfactory. The following formula is advised:

Copper chloride	30 grams
Hydrochloric acid (sp. gr. 1.12)	3 c.c.
Water	1000 c.c.

The print must then be well washed. The toning can either be carried out by two stages or one. For the former method, two solutions are used. The print is first treated with a tin solution:

Tin dichloride	10 grams
Hydrochloric acid (sp. gr. 1.12)	1 c.c.
Water	100 c.c.

The hydrochloric acid is necessary to form a clear solution, as tin dichloride partly decomposes in water alone, forming a milky solution of irregular composition. The second solution is one of the following mixtures:

1 c.c. of ammonia (sp. gr. 0.910) in........	20 c.c. of water
or	
1 gram of potassium carbonate	10 c.c. of water
or	
0.3 gram of dry sodium carbonate	5 c.c. of water

To get the best results the baths must be used in the order given. Thorough washing after the use of the first bath will give more uniform results, but somewhat corroded shadows and stained half-tones may develop. If only moderate washing is done, better tones are obtained, but the alkaline bath soon becomes contaminated with the tin salt and unsatisfactory.

Formstecher allows the print to remain from 1 to 2 minutes in the tin solution and 3 to 5 minutes in the alkaline solution.

Ammonia gives red-brown tones; sodium carbonate, violet-brown; potassium carbonate, intermediate results.

For the combined method, that is, in which

but one solution is used, caustic alkalies are employed. One hundred c.c. of tin dichloride solution, without acid, are mixed with 70 c.c. of a solution of sodium hydroxide (both solutions to be 10 per cent. strength), the mixture shaken until the precipitate first formed is dissolved, and then 80 c.c. of water added. If potassium hydroxide is employed, 100 c.c. of 10 per cent. solution of this will be required and 50 c.c. of water should be then added. With bromide paper, the sodium solution gives violet-black tones; the potassium, brownish. With gas-light paper the tones are livelier, the sodium solution producing sepia effects analogous to those obtained from platinum. The potassium solution gives reddish tones, suggestive of those obtained with selenium. The combined bath should be filtered before use and then remains serviceable for some time. The tones are permanent.

These methods are, however, not only applicable to developing papers, but P.O.P. yields excellent results, not attainable by any other methods. The chemical conditions forbid an addition of the tin salt to the toning-fixing bath, although such a method has been proposed and even patented. Formstecher made many experiments to ascertain the best method of treating P.O.P. and finally devised the following:

The print is bleached in the copper chloride bath given above, but which has been diluted to one-twentieth the strength there given. One minute's immersion is used, after which it must be well washed and then immersed for one minute in the tin solution (made with alkali, as given above). After this treatment, the print is not washed, but allowed to dry in the air, when oxidation takes place and the tone darkens, after which the print may be washed, but it is stated that in the unwashed condition it is quite permanent.

The essay discusses the subject of gold toning with the aid of tin salts and also the theory of the several processes. It is a contribution from research laboratory of the "Mimosa" Company, of Dresden.

Miss Sophie L. Lauffer, of Brooklyn, New York, gave an exhibition of some of her work, on invitation, at the studio of Nickolas Muray, 129 MacDougal Street, New York, from December 5th to December 17th, 1921. The exhibit was much admired and praised by the many that saw it. A feature of the occasion was a series of afternoon teas.

Stabilizing Diaminophenol Solutions

Lobel, in *La Revue Française de Photographie*, reports some experiments made with the substances recommended as preservatives for this developer. His method enabled him to determine the time at which the developer began to fail, and to follow the change until it became wholly inactive. He employed an Eder-Hecht sensimeter and made all developments on bromide paper after uniform exposure. Four sets of solutions were made up:

A. PLAIN SOLUTION.

Water	1000 c.c.
Diaminophenol hydrochloride	5 grams
Dry sodium sulphite........	30 grams

B. DESALME'S PRESERVATIVE.

Same as A, except addition of 60 c.c. of a solution of sodium stanno-tartrate. (See THE PHOTOGRAPHIC JOURNAL OF AMERICA for September, 1921, p. 381.)

C. BUNEL'S PRESERVATIVE.

Same as A, with addition of 5 c.c. of lactic acid (sp. gr., 1.21).

D.

Metol-hydroquinone containing 30 grams each of dry sodium carbonate and dry sodium sulphite in 1000 c.c. of water.

The following data of deterioration were obtained:

	A	B	C	D
Days at which the solution began to fail....	4	7	8	8
Days after which it was inactive	6	11	11	30

It appears, therefore, that the two preservatives are about of equal value. With the metol-hydroquinone the fall is slow, but with the other solutions the fall, when it once begins, is rapid.

The experiments showed, moreover, that the color of the solution is not necessarily an indication of its efficiency. The stabilized solutions are but slightly colored, even when they have lost their activity, while the metol-hydroquinone is active when distinctly colored. Further investigations are promised.

The ninth annual exhibition of the Pittsburgh Salon of Photography, under the auspices of the Photographic Section of the Academy of Science and Art, will be held in the Galleries of the Carnegie Institute, Pittsburgh, Pa., from March 1 to 31, inclusive, 1922. The last day for receiving prints will be Monday, February 6th. For particulars, address Chas. K. Archer, Secretary, 1412 Carnegie Building, Pittsburgh, Pa.

Developers for Lantern Slides

Dr. D. W. Horn, Professor of Inorganic Chemistry, Wagner Free Institute of Science, has used the following method for several years with much satisfaction. Three solutions are prepared:

1.

Hydroquinone	4 grams
Sodium sulphite (dry)	20 grams
Potassium bromide	2 grams
Water to make	200 c.c.

2.

Metol	3 grams
Sodium sulphite (dry)	20 grams
Potassium bromide	2 grams
Water to make	200 c.c.

3.

Sodium carbonate (cryst.)	20 grams
Water to make	200 c.c.

The sodium carbonate is the common washing soda. The metol in formula 2 should be fully dissolved before adding the sulphite.

Development is begun in a mixture of equal volumes of 1 and 2. If, within 45 seconds, the image begins to appear, the plate is over-exposed, but the action should be allowed to go on until some density is gained. If no image appears in 45 seconds, the plate is removed and immersed in a mixture of equal volume of 2 and 3 until a trace of image appears. The plate is then replaced in the hydroquinone solution. If enough detail is still not secured, recourse is again made to the metol mixture, and, in obstinate cases, the development may be completed in this. Lastly, the negative is rinsed and fixed. Process plates are always used for making negatives from books and maps.

Mr. Carl Boyer, Assistant to the Director of the Wagner Free Institute of Science, uses the following formulæ:

1.

Hydroquinone	5 grams
Potassium metabisulphite	4 grams
Potassium bromide	1.5 grams
Water	300 c.c.

2.

Sodium sulphite (dry)	28 grams
Caustic soda	3 grams
Water	300 c.c.

In winter, use equal volumes; in summer, add one-third more water.

Mr. Boyer does not claim originality for the method, but has found it very satisfactory in comparison with other standard methods.

Photographs Upon Tin Plates

Photographs made upon tin plates are a novelty. By tin plate the ordinary ferrotype plate is not meant, but the common tin plate, such as that which is used for making cooking utensils, the print being made upon the tin surface by means of asphaltum varnish.

When the print is made, developed and washed there need be no fear of the picture fading. There is nothing to fade, the material being the same as that which was employed for embalming purposes four thousand years ago by the Egyptians, and which we see today in the linen covering and the insides of the coffins containing mummies.

Bitumen, one of the component parts of so many black varnishes, is a substance known as mineral pitch, and used by photo-engravers as a sensitive film upon steel plates as a resist to prevent the etching fluid from attacking those parts of the fluids that have not been exposed to light, forming, as it does, one of the best resists known, the best effects being obtained by the use of a half-tone negative, the number of lines to the inch being immaterial.

Two formulæ are given, either will work satisfactorily. They are identical with those used in the photo-engraving houses.

NO. 1

Purified bitumen	150 gr.
Benzole	2 oz.
Chloroform	2 oz.
Oil of lavender	2 min.

NO. 2

Purified bitumen	½ oz. av.
Pure benzole	7½ oz.

The purified bitumen is usually in a flake state, but it will soon dissolve in either of the above liquids, which, as soon as dissolved, should be filtered through a tuft of absorbent cotton, pressed, not too tightly, in the neck of a tin funnel.

These preparations must be kept well corked, because the benzole, being highly volatile, would evaporate and leave the varnish too thick for use.

Take a piece of tin plate, cut to the size required. See that there are no indentations or scratches upon the surface. Place this upon a smooth piece of board, then dip a piece of soft rag into some flour emery. A few drops of water upon the tin plate will be enough. Rub the emery well over the plate, always in the same direction, never in circles or crosswise. This rubbing will even the surface considerably. It must now be washed in a stream of water, then fin-

ished by rubbing the surface with a little whiting and water in the same way as for the emery. This done, the plate must be washed once more, then dabbed dry with a clean cloth.

The bitumen solution may now be poured over the plate in the darkroom, the plate being tilted so that the whole surface becomes covered, then drained from one corner so that the excess is returned to the bottle and rocked so as to get the surface tolerably even, although by this plan a perfectly even coating cannot be obtained. To secure an even coating, the use of a whirler must be resorted to, which may be easily and cheaply constructed with two pieces of wood about fifteen inches long, two inches wide and half an inch thick, with a common box hinge attached to an end, and two strips of elastic tacked upon the lower end, at the sides with a notch or gap cut across the wood, to form a ledge to grasp the plate, the elastic giving the necessary tension when the ends are pulled apart to hold the plate in position, these legs of wood forming a shape like the letter A, the hinge being at the top, and the elastic passing from side to side corresponding with the center crosspiece of the letter.

At the top where the hinge is affixed at one end of the central holes of the hinge an ordinary screw eye is affixed. To this is attached a piece of stout cord, the top of which is attached to a nail or screw eye in a beam or ceiling, the lower part of the cord near to the hinge is grasped by the palms of each hand, pressing the left hand forward and the right hand backward, will cause the wood holding the plate to rotate. By this means, if a metal plate is coated with bitumen, then inserted in the whirler *face down* and the whirler rotated, the bitumen film will become evenly spread all over the plate by centrifugal force, and quite dry in less than one minute.

As soon as the coated surface is dry it may be placed upon a negative in a printing frame with a piece of sheet glass in front, and submitted to considerable pressure by increasing the tension of the spring. The plate is now ready for exposure. The printing frame must be placed into the sunlight if possible, and the time of exposure may be one or two hours; in ordinary daylight, it would require much longer.

The plate is now removed from the printing frame. Assuming that it is a 4 x 5, or less, in size, it is then placed in a 4 x 5 tray and 1½ ounces of spirit of turpentine with 2 drops of oil of lavender added is poured over the plate and the tray rocked. When the exposure has been hit right, the image will begin to develop in the course of from half a minute to one minute. Those parts where the light has not acted dissolves away. This process must not be continued too long. Just as soon as the image appears to be nearly developed it must be removed from the tray, drained slightly, then washed in a stream of water from the faucet. The image will soon loom up in brown dots upon a silvery white base. As soon as the water has been drained, the adhering tears absorbed with a strip of blotting paper, the tintype is finished.

Intensifying Autochroms

As a general rule most of the autochrom color transparencies made by amateurs are all the better for intensification. Many formulæ have been put forward for this, but most represent difficulties in making up or are uncertain in action. The uranium intensifier, though quite effective in adding density, tends to upset the balance of the colors. Pyro silver has often been recommended, and is the formula put forward by the manufacturers, but I must say that in my hands it has not proved very satisfactory. Other workers pin their faith to the mercuric intensifier, but, after a careful trial of most, I prefer the chromium bleacher as introduced by the late C. Welborne Piper, which has several distinct advantages over the others. It is simple to use, its action is certain, and the degree of intensification is easily controlled, and, not least in importance to many, the formula contains no scheduled poison. A description of my own method of using the chromium intensifier for autochrom plates, though not new, may be of value to others. Many workers assume that the chromium intensifier is not equal in its results to those given by the more complicated pyro-silver, but I can only say that, in my own hands, the results are decidedly better, and, provided ordinary care is taken, the process is absolutely safe and certain even when used by the inexperienced worker.

In the first place, a little discrimination is needed in deciding when an autochrom needs intensification. If the plate, after being removed from the second developer, seems satisfactory in every way, except that it is thin and the colors have a weak and washed-out appearance due to over-exposure, the qualities of the picture may be made good by careful intensification. This must not be mistaken for the flat, heavy results of under-

exposure and the plate intensified under the impression that the additional density gained will put the matter right. For these there is no real cure, though reduction sometimes has the effect of slight improvement. But, in my opinion, these are best thrown away and the exposure repeated, correcting the original error.

Prior to attempting intensification upon an over-exposed plate, the transparency should be put back in the developer for at least another five minutes in strong light in order to insure that the picture is fully developed. If this is neglected after the final redevelopment, when the plate is afterwards put in the necessary fixing bath, the action of the hypo upon the reduced silver may leave practically nothing of the picture. It is a good plan in order to insure that the second development is effective, if the plate is to be intensified, to give the plate a few minutes in a bath of fresh developer.

To proceed with intensification, the bleacher may be made up according to the formula published in *The British Journal Almanac*, which I quote:

A.—Potass bichromate, 1 oz; water, 20 ozs.

B.—Hydrochloric acid, pure, 1 oz. fl.; 1.160 sp. gr. to 10 ozs.

The most satisfactory bleaching bath for autochrom work is made up of 4 ozs. of A, 3 drachms of B, with 16 ozs. of water, or the tabloid preparation issued by Burroughs Wellcome & Co., may be employed. The latter is very convenient, as the process is not one employed very frequently.

The transparency should be taken from the second developer and well washed in order to get the developer out of the film. This, with the thin autochrom film, takes only a few minutes, when the plate is ready to be placed in the chromium bleacher. The action of this is rapid, half a minute being sufficient to bleach the film thoroughly, after which the plate should be held under a gentle stream of water from a tap for two or three minutes or until the film is fairly free from the yellow stain.

Redevelopment may then be proceeded with. The old developing solution should not be used, for I have found that there is a tendency for its action to be uneven, and particularly if it has been partially exhausted or discolored by previous use. Moreover, its action is slow, and with the extreme delicacy of the autochrom film anything that tends to prolong immersion in any of the solutions is to be avoided. My own preference is for Rytol, though amidol is entirely satisfactory and perhaps advisable if a second application of the intensifier is necessary, though any good non-staining developer will give good results.

If at the end of a couple of minutes in the developer the plate is examined it will probably be found considerably improved in color rendering. It may, however, be thought that it is still far from perfect, and in this case the process may be repeated even to the extent of five or six times, provided the film does not show signs of leaving the plate or of blistering. Before the plate is bleached again the developer should be thoroughly washed out, for if this is not done there is a tendency for the action of the intensifier to be uneven, or stains may result. I have often intensified a weak over-exposed autochrom several times and succeeded in the end in producing a passable transparency. Care should be taken not to hurry development by taking the plate out of the solution too soon, and if the solution is a non-staining one the process may be allowed to continue for several minutes, which insures the image being fully developed out.

It sometimes happens that, after repeated intensification, the whites of an autochrom plate may become stained and the colors somewhat dull and brownish. If this happens the plate may be cleared by immersing it in a non-acid permanganate solution. MM. Lumière recommend the following formula:

Potass permanganate	15 grs.
Water	35 ozs.

Care must be taken not to mistake this for the reversing solution. If the autochrom has become too heavy in character, the colors appearing clogged up and thus indicating that the intensification has been too great, it may be reduced by immersing it in the acid permanganate reversing solution used after the first development. This must be diluted to about thirty times its usual strength, or to a pale pink color. The action of this reducer is rapid, and the plate should not be left in it for more than half a minute. A very short period of immersion in this bath will be found to clear the image very considerably.

The next step is fixation. MM. Lumière say that fixing is indispensable when an autochrom has been intensified. This probably applies more to the silver intensifier, which forms a fresh silver compound, but a fixing bath, if not absolutely essential for the chromium method, does no harm provided the plate has had a full second development in full light. I give my own autochroms

about three minutes in an ordinary acid fixing bath.

All that then remains is to give the plate a brief wash, say, for about five minutes in a gentle stream of running water, this being sufficient to remove the hypo from the film, after which the plate may be set up to dry in the usual way.

The foregoing, I think, deals fairly exhaustively with the advantages derived from the use of the chromium bleacher in autochrom work. One other point I may add. All intensification should be done when the plate is wet, as an autochrom that has once been dried, when rewetted, tends to produce a crop of the green spots that were the bugbear of the photographer in the early days. Also, quite apart from this, the chances are the film may frill or entirely leave the glass. The worker should make up his mind as to the further treatment of the plate while it is still in the second developer, and the work should be at once proceeded with, thus avoiding rewetting.

It should be the aim of the color photographer to select his subject and so time his exposure that intensification or reduction will not be needed. There is a danger that the quality of the work may suffer through the photographer becoming careless as to his exposures, thinking that after treatment will put matters right. It may or it may not, though my own belief is that nothing can equal for beauty or brilliancy of color an autochrom that has been so exposed that no further treatment is needed beyond the second development. However successful intensification methods may be, they should be the exception and not the rule.—*Robert M. Fanstone, in The British Journal of Photography.*

Monohydrated Sodium Carbonate

The common washing soda, or washing crystal, used in the laundry, contains more than half its weight of water. Exposed to air at ordinary temperature it loses some of this water, the amount depending on the dryness of the air and the time of exposure. For this reason its composition is somewhat variable, and solutions made up with it will be of uncertain strength. In many applications the dry substance is used, as this is fairly constant in composition, the differences being only the slight amount of water that may be taken up by absorption just as any other fine powder would act. Another form has been introduced and been made official in the United States Pharmacopeia for use by druggists. This is monohydrated sodium carbonate, which contains only one-tenth the water that is combined in the ordinary crystallized form. This keeps well in ordinary air, is much more concentrated than the common form and yields solutions of uniform composition. It does not seem possible that either of the three forms should give different results when used in equivalent proportion, since as soon as the substance is dissolved the sodium carbonate alone is active, the water that may be in the crystal mingling with that used for solution. The monohydrated salt is, however, a carefully prepared product of fairly uniform composition, features that have recommended it to the pharmacists and may equally recommend it to photographers.

The ratio or strength is as follows:

Crystals or washing soda..........	286
Monohydrate	124
Anhydrous	106

Preparation of Plates for Ultra-violet Light

Photography offers the only satisfactory method for recording the phenomena of ultra-violet and infra-red light, inasmuch as these rays are invisible to the unaided eye. It is fortunate, indeed, that the ordinary silver salts are sensitive over so wide a range. It is true that many of the invisible rays can be observed by means of a fluorescent screen, but this does not furnish a permanent record. Research has shown a wide range of both forms of rays, and one serious interference with investigations is that ordinary glass is practically opaque to all vibrations above the violet, so that resort must be made to quartz, fluospar and other substances, either rare or difficult to obtain in clear condition. The recent inventions, however, by which quartz can be cast in the form of clear plates and tubes will be of advantage in these researches. In a recent issue of the Journal de Physique (1921, ii, 156), Duclaux and Jeantet describe a method of treating ordinary plates so as to increase greatly the sensitiveness to the higher vibrations. They had need of plates sensitive beyond 1900 angström, and tried the procedure advocated by Schumann, but found it tedious and uncertain. Schumann plates are distinguished by the small proportion of gelatin, and it was thought that this condition could be secured by degelatinizing to a great extent ordinary plates. Trials of various methods, such as immersion in warm water, acid solutions, digestive enzyms, were with-

out success, but a simple and satisfactory procedure was devised.

The plate is placed horizontally in a dish with dilute sulphuric acid (one volume of the strong acid to ten volumes of water), and kept for four hours at room temperature (about 77° F.), the temperature being a little higher than this at the beginning and a little lower at the end. They are then removed to a dish in which they are washed by a very slow current of water, as the remaining gelatin is tender. Thirty minutes will be a sufficient washing. They are then dried, which requires but little time on account of the small amount of gelatin present. Plates thus treated retain a thin layer of emulsion poor in gelatin and uniformly spread on the glass. This deposit is extremely sensitive to ultra-violet rays, but is also very fragile, and the authors recommend that before developing the surface should be coated with a thin film of collodion, the plate being immersed in the developing bath before collodion is quite dry. Although most commercial plates are adapted fairly well for this procedure, it is likely that trial with many forms will show some more suitable than others. For rays of much greater wavelength than above noted, these plates are ten times more sensitive than the best plates prepared according to Schumann's method, and at least 200 times as sensitive as the plate in its commercial form.

Another method for obtaining plates of high sensitiveness to short wave-lengths is by covering the emulsion with a layer of fluorescent substance. Such a substance absorbs, so to speak, the short waves and emits in turn waves of greater length, to which the gelatin is transparent, and thus permits an action on the silver compound, hence the impression is made as if the gelatin was not present. For this method, substances giving blue or violent fluorescence should be chosen, and they should be dissolved in a liquid that will not swell the gelatin, and is not absorbed by it, since the efficiency of the process depends on the fact that the fluorescent rays act before the light enters the gelatin film. Water is, therefore, not applicable. The authors obtained good results with a solution of esculin in glycerol, but found most satisfactory results with lubricating oil. Many of the commercial forms of these have a distinct fluorescence due to hydrocarbons. It is sufficient to smear a few drops of such an oil over the emulsion by means of a wad of cotton. After exposure this film should be removed by means of ether or alcohol. A very thin fluorescent layer may be obtained by immersing the plate for a few minutes in a solution of the fluorescent oil in light petroleum or alcohol and allowing the solvent to evaporate. These procedures are simple and effective. They enable the operator to secure photographs of rays ranging from the extreme red to the limit of the ultra-violet. One slight defect is noted, a very small enlargement of the rays by irradiation, but this does not go beyond the twentieth of a millimeter.

The processes have been tried with many commercial plates, and the sensibility is found to be greater than with the sulphuric acid method. It is possible, indeed, to carry out an instantaneous spectrography. Detailed results with certain metallic spectra are given in the paper.—Journal of the Franklin Institute.

Photographing the Alps

Those of us who have been fortunate enough to visit the Alps and to climb over their icy slopes know how difficult it is even with a guide or two in attendance to brave the cold wind of their icy slopes, how dangerous it is to cross some of the crevasses, where a slip means certain death. To carry a small camera in some places is next to impossible, yet Monsieur Tiarraz, with the assistance of a porter, made his photographs with a 16 x 20 camera, using glass plates. Days of sunshine are rare in the high Alps, and again and again he had to descend without pictures owing to snowstorms, high winds and avalanches; consequently the pictures shown were the result of several months' work. There was no posing, for the climber on Mount Blanc has little time for this, as he must make the climb in a certain time or run the risk of being frozen to death. In order to obtain the pictures, Monsieur Tiarraz usually went ahead of the party, and found a point of vantage which he knew the climbers must pass. In order to do this he had to leave the regular track as laid off by the guides, and several times he fell into crevasses, although he declares he never had a serious accident.

After a picture was made he followed the climbers to a point where they rested, and after resting only a few minutes he went ahead again and set up the instrument, waiting until they passed. Sometimes it was necessary for both himself and the porter to hold the big instrument to keep it from blowing down the mountains. Coupled with this, it was always intensely cold, and his

fingers were many times so numb that he could scarcely remove the plate-holder. Of course, every picture was not to his liking, so he tried again until he succeeded. "To be sure, it was dangerous," he said in French, with a little shrug of his shoulders, "but I wanted the pictures, and it was the only way." This was said in a simple, quiet way, yet this man has taken more risks and made more sensational pictures than all the other Alpine photographers together.

Reproductions of Manuscripts, Plates and Drawings Without a Camera

Le Procédé gives an account of the procedure term "Manul," which although patented some years ago, is just now attracting a good deal of attention in the technical journals. It is the invention of Max Ullman, who has made a partial anagram of his name as the title. *Le Procédé* claims that substantially the same principles were applied about 1890 by Yvon and more recently by Fontenay, the only important difference being that the French workers used gelatino-bromide emulsions, while Ullman uses an egg albumen-bichromate film. The sensitive plate is placed in a frame provided with a glass front, the uncoated side of the plate being turned towards this glass. The document to be copied is placed with the text in contact with the sensitive surface, the frame closed and exposed to the light. Under these conditions, the light which passes into the system is absorbed by the lines of the design, while it is reflected by the unprinted portions of the document; broadly speaking, it may be said that the amount of light acting on the sensitive surface where the high lights are, is double that which acts in the shadows. If, therefore, sufficient exposure is given, the high lights of the original will be, in the coating, completely insoluble, while the design will represent a somewhat soluble area. By development, a relief is produced from which copies may be obtained. The original patent does not give satisfactory details, but Aug. Albert, Professor at the Institute of Graphic Arts at Vienna, communicates to *Photographische Korrespondence* some experiments on the procedure and claims to have obtained satisfactory results. The thick layer that results when ordinary gelatin bichromate mixtures are used is not applicable in the process, a very thin sensitive layer being necessary. Albert gives two formulas stating that both give good results. The sensitizing mixture should be spread by means of roller, as it must be extremely thin and colorless.

Formula 1.

White of egg solution in water.	25 c.c.
Clarified liquid glue............	20 c.c.
20% solution of potassium bichromate	20 c.c.

Mix thoroughly.

The white of egg should be beaten to a foam and then filtered. The glue solution is the same used in enamel work.

Formula 2.

Water	60 c.c.
Liquid glue	30 c.c.
10% sol. ammonium bichromate	24 c.c.
Pure sugar (12.5% solution)..	20 c.c.

Mix thoroughly as before and add a few drops of glycerin. The materials used are not as clearly defined as they should be, but it is evident that the basis of one mixture is an albumin solution reinforced by gelatin, and that the commercial egg albumin and a high grade gelatin can be used. In such case, a 14% solution should be used. The albumin should be in fine powder and dissolved in cold water. The other mixture relies practically on gelatin and sugar, thus being substantially the gum bichromate method. The main point in the process is to secure a thin and very transparent film.

The duration of exposure is a serious difficulty, and it is recommended to use a very strong light of constant power. It is likely that a number of trials will be required before any exactness can be obtained. The development should be in cold or at most very slightly warmed water. After this is completed, the plate is immersed in a solution of fuchsin or some similar color, then into a yellow color (chrysoidin is recommended) in order to get a strong and non-actinic tint. After a short rinsing, the negative is used in the usual way for copying on metal.

In this connection, attention may be called to a process of copying without a camera, described and illustrated by Dr. Henry Leffmann at a lecture before the Franklin Institute and published in the Journal of the Institute, vol. 178, (1914) p. 743. This consisted simply in placing the sheet to be copied upon a glass plate that had been coated with luminous paint, the paint having been strongly activated by exposure to strong light. Upon the original sheet, a sensitive plate, film or development paper was placed and the luminous surface al-

lowed to act for about ten minutes. Of course, the arrangement must be made in the dark and care taken that the sensitive surface is not exposed to the luminous one, except through the subject to be copied. For copying short letters or diagrams written only on one side of the paper the process is satisfactory. It will not answer for copying from papers containing matter on both sides as there will be confusion, but that objection seems to apply also to the process above described.

Continuing Action of Light on the Chromates

As early as 1869 it was noticed by workers with carbon that when the print had been exposed to the light somewhat short of the proper degree, that the impulse of the initial exposure was continued in the dark.

Eder explains the phenomenon from the well-known fact that the chromated gelatine becomes less soluble and that in consequence of this tendency, slightly exposed half shadows due to brief light action during printing become only slightly insoluble, and will, after aging of the film, become sufficiently insoluble to resist the action of the water solvent.

Gaedeke remarks that the chemical process taking place by exposure should not be regarded as simply the formation of chrome-superoxid from the bichromate exercising a strong toning action upon the gelatine, but, on the contrary, that intermediate products between chromic acid and chrome-superoxid result.

The chrome oxid with the chromic acid forms a number of well-defined compounds which are so much the more soluble the more chromic acid they contain.

Four distinct compounds of chrome oxid with chromic acid are known varying in degree of solubility. But besides these, there is known still another which apears to exist when the bichromated gelatine is exposed to strong light.

To follow intelligently the printing by bichromate method, one should note that the bichromate contains one-half of its acid content, so free that it may be regarded as a monochromate associated with chromic acid.

The further the reduction proceeds, so much richer is the compound in chrome oxid, and as an end product of the reduction, the two-thirds chromate-chromeoxid will appear, but not the single chromate-chromeoxid.

In consequence of this instability of the chromate in the gelatine, it is easily explained why the action set up by the initial exposure goes on after removal of the film to darkness. It is purely a chemical action and an attempt of the dissociated molecules to form an equilibrium.

Glycerine Contributory to Fading

The *British Journal of Photography* for June 17th has an editorial paragraph on the possibility that the use of glycerine, to ensure flatness of the bromide paper print, is a factor contributory to the fading of the image.

It is the practice with many, especially where heavy grade bromide paper is used, to give the finished print a weak bath of glycerine in water to prevent curling. The writer observes that it is his experience that a bromide exposed for any time to damp atmosphere is liable to fade, but such as are carefully preserved from moisture retain their brilliancy.

The hygroscopic quality of gelatine is well known and the content of glycerine to the water bath retards complete drying or makes the surface of the print open to the influence of sulphurous vapors, contributory to its ruin.

W. S. (Daddy) Lively, of the Southern School of Photography, McMinnville, Tenn., wishes to get in touch with his former students to send them a class pin. The pin is distinctive and serves as an insignia of recognition on the meeting of fellow students.

Quite a few of the addresses of the students have been changed and it is impossible to locate them, but if those past graduates who see this notice write "Daddy" Lively at once, he will send a pin free.

Photography has received an unusual tribute in that the United States Government has given it official recognition. An Exhibition of Artistic Photography by Floyd Vail, F. R. P. S., of The Camera Club, New York, is on view at the Smithsonian Institution, United States National Museum, Section of Photography, Arts and Industries Building, Washington, D. C. The exhibition will be open until February 15th, 1922.

Mr. Vail is to be congratulated for being the pioneer of such an exhibition.

The Photographic Journal of America

February 1922

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The PHOTOGRAPHIC ·JOURNAL· ·of AMERICA·

A Monthly Magazine Devoted to the Science and Art of Photography

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POSING AND REALISM IN NATURE PHOTOGRAPHY—L. W. BROWNELL

THOSE who have never tried to use their camera on the living wild things can never have realized that, among the many difficulties with which a Nature photographer has to contend, that of posing his subjects is by no means the least, nor is it one that can be, in every instance, readily overcome, even by one of long experience in work among the wild creatures of the woods and air.

It is entirely true that in the great majority of instances one's subject poses itself, and we are forced, whether we would or not, to accept its idea of posing, if we would have its photo at all. Moreover, where the pose is unconscious, as it almost always is in the case of the wild things, it is in most cases sure to be eminently satisfactory as being entirely natural.

There are, however, many instances, especially when working with young animals or birds, insects, reptiles, etc., when one's artistic ability, if he has any, can be used to good advantage, and when one can, by the use of a little judgment and patience, obtain much better results than he would by simply making his exposure at the first opportunity offered.

In work upon birds at the nest or with their young, we can often force our subjects unconsciously to assume the pose that we wish, or at least to take such a position in the picture that would go furthest toward making a pleasing ensemble. This is accomplished by making the spot upon which we would like the old bird to perch the most easily accessible to the young, or, when possible, have two or three such perches on any of which the old bird would show to good advantage. It is always best to do this when possible, for I have learned, through sad experience, that birds are most obstinate and contradictory subjects, and it often seems as though their one object in life was to try the

patience of the one waiting to get their photograph as much as possible by alighting everywhere but upon the one spot arranged for their accommodation. In arranging the accessories of the nest so as to leave these conspicuous perches, we must exercise great care not to eliminate too much or to make the perches so conspicuous that they will be noticeably arranged in the resulting photograph. Everything must be left absolutely natural, for this is the one great requirement for success in Nature work. Once let your pictures have the smallest note of unnaturalness and the picture is spoiled. As well work from stuffed specimens, and this is the last resort of the "Nature fakir."

When the young have reached the age when they can, with safety, be taken from the nest and perched upon a branch, we can, but not without the exercise of considerable patience, pose them to a greater or less degree after our own ideas of the artistic, at least we can place them in such positions as to obtain the best effects of light and surroundings. Let no one, who has never handled young birds, get the idea that this is an easy job, or he will be wofully disappointed if he ever tries it. It can be accomplished, however, with care and patience and gentle, careful handling of the young, so that they may gain confidence in you rather than be scared, is the one thing absolutely necessary.

There are those who advocate the photographing of birds or mammals in captivity as being the best method of obtaining their pictures. I am not one of them, however, for I have never yet seen a photograph of a wild thing taken in a studio amid built up or artificial surroundings that I could not at once pick out as being just what it was, the picture of a half-tamed creature in a cage, rather than of the same creature among his natural surroundings. No matter

"THE BROWN THRASHER OFFERING ITS OFFSPRING A DELICIOUS 'BUG' TIDBIT." L. W. BROWNELL

"THE STREET SWEEPER" PETER J. SCHWEICKART

Kalosat lens, 6¾-inch focus.
1/65th second exposure, at f4.5,
on dull day; late afternoon.

HOWARD D. BEACH
BUFFALO, N. Y.

From the P. A. of A. Exhibit at Buffalo

how adept one may be at building up these artificial backgrounds and surroundings, there is sure to creep in somewhere an unnatural note that, to me at least, completely spoils what might otherwwise be a fine picture.

It is my contention, and I do not think that any naturalist will disagree with me, that in a branch of photography, the results of which must obviously be true to nature, if they would have any real value, one cannot afford to miss any of the small details that go to make up the truthful whole in depicting incidents of the everyday life of birds or beasts. In order that we should miss none of these details, it is equally obvious that these wild things should be photographed in their native haunts, and I cannot think that removing them to a studio, especially prepared and keeping them there until they are reduced from their original wild state to one of semi-tameness before photographing them, is true Nature photography, no matter what backgrounds are set up or surroundings arranged to make them feel more natural and at ease. They never do feel entirely natural nor at ease and this is bound to show, to a more or less marked degree, in the resulting photograph. Moreover this method of work is misleading in its results for, while these results may be fairly perfect pictures of the animals themselves, they give no accurate idea of how they live

"CECROPIA, JUST AFTER LEAVING COCOON."
L. W. BROWNELL

their everyday lives or if some such idea is conveyed to the mind of the novice. it is almost certain to be an erroneous one, for there is invariably a false note somewhere.

However, it is rather fortunate that not many can avail themselves of this method, as it requires a specially built and prepared studio, a considerable amount of material to be used in building the surroundings and a special knowledge of how to build and set up these surroundings so that they may even approach the naturalness that they should have. Altogether it is much too expensive a method to attract many of us aside from any other drawback that it may have.

I have made mention of making use of stuffed specimens as a last resort in this work and, as hard as it may seem to comprehend, there are those that use this despicable method in order to obtain results. Fortunately these results rarely deceive any but those who have no acquaintance with the wild things. One of the worst features of this method is the fact that it helps to discredit the work of those honest nature workers who obtain their photos by hard work and untiring patience.

There is a sharp line between direct faking, studio photography and the

"TREE-TOAD—SINGING." L. W. BROWNELL

legitimate control of your subject such as you can, on many occasions, use in field work. To cut away or press back all intervening herbage in nest photography or even to entirely remove part of the surroundings or to introduce something into the picture that would enhance it, is, in my opinion, perfectly admissible and even to be advocated. We must, however, be extremely careful not to eliminate too much or to make the elimination perceptible and, on the other hand, such things as we introduce into the picture must be entirely in keeping with the rest of the surroundings, otherwise it is best to keep them out. In fact it is well never to place anything in the picture that was not originally there, unless with the intention of telling some definite thing, such as the season of the year when the picture was made or in what surroundings or to accentuate the nature of the situation or some such real reason. Never introduce articles merely for the sake of filling up the picture for, after the picture is made, you will invariably find that it was a mistake and wish you had not when it is too late to take them out.

It is but a few years since nature photography was in its infancy, and yet so quickly was it recognized to be not only the best, but really the only medium for truthfully portraying wild life that the publisher, who now-a-days puts on the market a work, popular or otherwise, on any branch of Natural History and does not illustrate it profusely with photographs, is behind the

"RED SQUIRREL." L. W. BROWNELL

times. Unless, however, these photographs show the animal as he really is, and not as we may, perhaps, think he ought to be, as long as there is in them the least note of unreality, they are but one step in advance, and a very poor one at that, of the old time method of illustrating our nature literature with bad, often grotesque, drawings. Indeed, I am not at all certain that it is not a retrograde movement.

I can readily understand why some photographer-naturalists allow themselves to be led into producing pictures that are, to greater or less extent, falsehoods. The photographing of the wild things is, at best, difficult and, to many, anything that tends to lessen the obstacles is welcomed. To take advantage conscientiously of any means that will make the difficulties fewer is perfectly legitimate, so long as these means do not attack the truth of the picture. Unfortunately, there are some, who apparently do not consider it at all necessary that the picture be realistic, so long as the image of the subject be large and well defined, but the ends never justify the means.

Realism is the main thing for which to strive in the making of Nature photographs and we can never make a realistic picture except from the living things themselves and in their natural surroundings. Therefore, from my point of view, unless we can obtain such pictures it is much better not to take them at all.

METHODS OF ACCOMMODATION

THE artistic use of the word "tone" is somewhat unfortunate, or, rather, it is unfortunate that the meanings of tone and gradation are used ambiguously in art parlance.

Tone is frequently used out of place, as if it were synonymous with harmony, and as if to make obscurity in definition more obscure. Art writers in photography frequently leave one in doubt whether they mean "tone," as the painter understands the term, or merely color, as a black, a sepia, a brown, a platinum, etc. Tone, gradation and harmony of color are quite distinct qualities, and ought not to be used interchangeably.

Of a truth they are closely related, and we might say, as far as two are concerned—harmony and tone, it is doubtful whether they may be divorced in a picture.

Tone, about which we are here concerned more particularly, is dependent upon proportion and gradation, rather than on intensity of color. We may thus have low and high tone.

Light and shade, which are the media by which the photographer gets effect, is really of the first importance even to the painter, for without it painting would be only outline masses of contiguous color; but essential as it is to pictorial relief upon a flat surface, there is a danger of falling into unnaturalness and affectation, especially by the impressionist photographer, who is often very extreme.

He may get the right quantity of light and shade in the handling of his

"BETTY CARPENTER" NED VAN BUREN

WOOLWORTH BUILDING © NED VAN BUREN

subject, but too often his pictures lack diversity in quality, and have nothing of that beauty of gradation we see in Nature.

Not only reflection, but the interpenetrations of light produces an infinite variety in the light and shade, and unless the artist chronicles some of this diversity of phases, we feel that something is wanting in the picture.

Where the true relation of every part of the picture to the high light in it is not respected or purposely slighted, a hard impression is always produced. All the different elements, the various areas of light and shade, must be rounded out and put in proper relation by assigning to each a due proportion.

It makes no difference whether we take a portrait out in the open or with very subdued light in our studio, so that the lights on the nose, chin and forehead are in proportion to the shadows on the sides of the face and shoulders.

Representing the face upon canvas or paper requires the same means to get proportionate effect as the musician uses. He is obliged to transpose the key, yet he always retains the relations. He would not dare to reach either too high or too low notes, and likewise certain devices are not only admissible, but also indispensable in portraiture. They may be made use of to give agreeable shapes to the lights and shades and roundness and unity to the whole picture.

Devices, however, should always be employed consistently and in accordance with truth and reality. In portraiture, the dress is apt to give the leading and predominant tone to the picture, and care is demanded to see that its tone is duly balanced and distributed. Black costumes are favorites with many portraitists, because one is able to oppose them agreeably to the bright tints, in this way giving depth and richness of effect.

A low-key white dress, or a white one set off by warm tones, is very effective. Sometimes a pleasing effect is produced by placing a white dress against a light-gray background, and even a background but slightly differentiated from the drapery.

A white ground turned toward the shadow side of the studio will come out soft, gradated gray, even more pleasing than a skillfully artificially gradated screen. Such an arrangement gives a beautiful silver aspect to the picture.

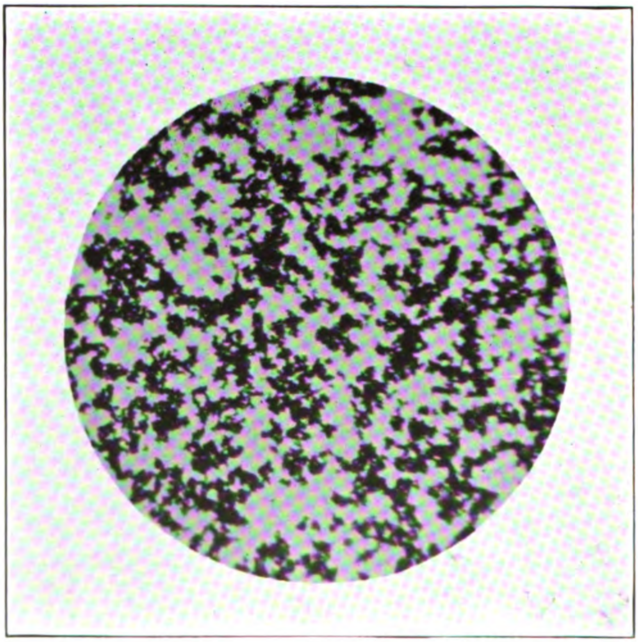
A touch of decided positive tone, here and there, may be found necessary to carry out the harmony. A dark rose in the hair or on the bosom, or nice management of some object held in the hand, will preserve the portrait from having a cold, unnatural effect.

There is no limit to the variety of effects obtainable by consistent, tactful and tasteful treatment, springing from a laudable desire to make something pleasing to the eye, and not engendered solely from the motive or startling by bold, vulgar dash of execution.

There is always more danger of failure in the struggle after brilliancy than there is in the natural yielding to simplicity; however, do not interpret this as a license for tameness and insipidity.

PHOTOMICROGRAPHY IN THE STUDY OF PAINTS

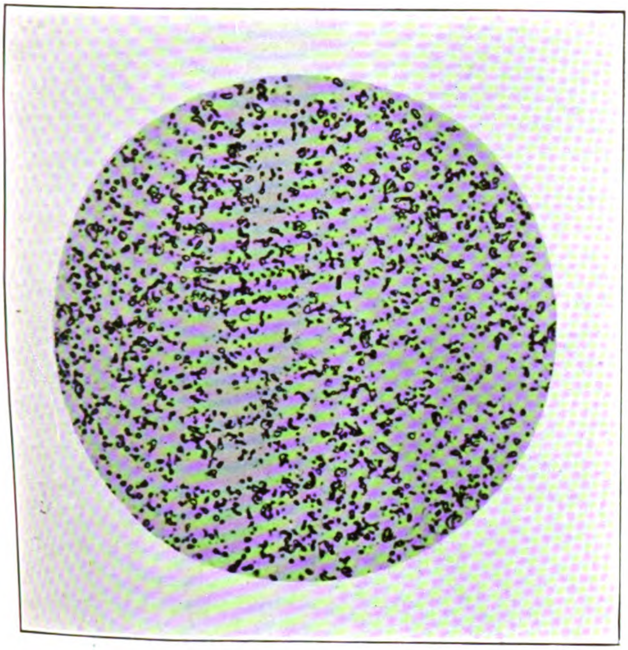
PHOTOGRAPHY has been of great use in extending the work of the microscope. This is due, not merely to the fact that by means of the sensitive plate a permanent and accurate record can be obtained, but as the emulsion is sensitive to rays of light invisible to the human eye, a wider field of distinction is available. Mr. Henry Green, in a paper published in a recent issue of the *Journal of the Franklin Institute* presents in considerable detail, methods of examining commercial paints by means of photographs made under high magnification. The question of the size and general nature of the pigments in paints is of importance in the arts, and much attention has been given to the subject. In the application of the microscope to ordinary biologic and medical work, no great variation in size of the objects is usual, but the pigments occurring in paints show great variation, so that to get the data necessary to determine the average size, many measurements must be made. To do this with an ordinary measuring apparatus would be very tedious. It is, however, of practical importance that minute measurement should be made if a proper standard of product is desired, and the author of the paper believes



Courtesy of the Franklin Institute

TIMINOX, 250 DIAMETERS

This is the type of pigment photomicrograph commonly found in the literature on paint. It is *not* suitable for particle measurement. The magnification and resolving power, under which the photomicrograph was taken, were both very much too low. It is impossible to detect individual particles. In addition the pigment is not dispersed.



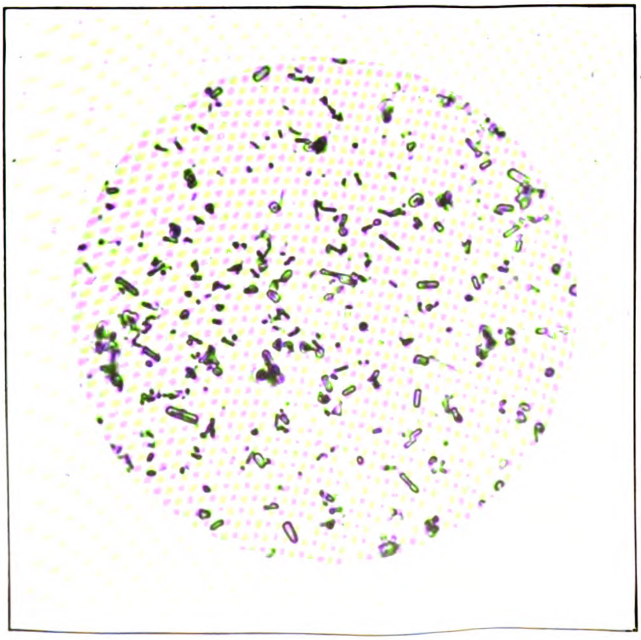
FRENCH PROCESS ZINC OXIDE, 1500 DIAMETERS

This particular sample of French Process Zinc Oxide approaches the limit of fineness to which the photomicrographic method is applicable. To go below this will require quartz lenses and ultra-violet light.

Courtesy of the Franklin Institute

LOW LEADED ZINC OXIDE, 1500 DIAMETERS

This photomicrograph is well suited for measurement. The crystalline outlines of a number of the particles are clearly shown.



Courtesy of the Franklin Institute

that, in a few years, competition will require the manufacturer to carry his measurement of pigment particles down to a very minute point.

The method suggested by Mr. Green is not claimed by him as new in principle, but as new in the special method of application, which is to make photographs at such magnification as will show clearly and distinctly the original particles, which are then measured from the negative by a specially devised method. The preparation of the specimen is described and the mounting of it. The photographic apparatus uses transmitted light which must be accurately axial, as oblique illumination will give distorted images. A beginner will find it advantageous to use at first a fine grained contrast plate with hydroquinone, but after some experience, panchromatic plates with a pyro developer will be advisable. A special plate of this character is now sold. In the actual work it may be necessary to sacrifice definition somewhat to high magnification, but this sacrifice should never go so far as to blur the edges of the particle. With a 2mm. objective, a magnification of 1500 diameters will usually give satisfactory results with the finer pigments. The coarser material will show well with lower powers. Since many measurements are necessary for securing an average, an ingenious method has been devised. The negative is projected on a screen at such a distance that a magnification of about 20,000 diameters is obtained, and about two hundred particles are measured with a millimeter rule, disregarding fractions of a millimeter. In order to ovoid duplication or skipping, the area of the screen should be laid out in small squares. The liability to error in these measurements is discussed and the several types of errors described.

The paper is illustrated with photogravures showing, among others, samples of commercial zinc, oxide and white lead, the two white pigments used in the best paints. The individual particles are very clearly shown under a magnification of 1500 diameters. The contrast of these pigments with the much coarser particles of barytes (barium sulphate) is quite striking.

THE SILVER PRINTING BATH

IN THE sensitizing of paper for the purposes of photographic printing, the exciting or sensitizing bath is one of the most important features of the process; hence a few notes concerning its preparation and preservation may not be out of place.

The usual method of making paper of any kind sensitive to the action of light is, after having previously impregnated it (or "salted" it, as it is termed) with an alkaline chloride, to float it for a varying length of time on a solution of silver nitrate. This solution is called the silver "bath," and consists of silver nitrate dissolved in water, with or without the addition of other substances, the strength of the solution varying from 35 to 60 or 70 grains of the nitrate to the ounce. The precise strength necessary to produce the best results depends upon the amount of chloride used in salting the paper, but for the several brands of paper now found in the market, both plain and albumenized, a

FRANCIS J. SIPPRELL
BUFFALO, N. Y.

From the P. A. of A. Exhibit at Buffalo

GERHARD SISTERS
ST. LOUIS, MO.

From the P. A. of A. Exhibit at Buffalo

strength of 50 grains of silver nitrate to the fluid ounce of water will be found to be a safe average.

Silver baths may be divided according to their composition into three classes.

The first class comprises such formulæ as direct the use of only the silver nitrate and water. A bath made according to this plan, and containing from 50 to 60 grains of silver nitrate to the ounce is capable of producing excellent results. It is not apt to discolor with use, and by occasional purification, as afterwards to be described, will last for a long time. It should be kept slightly alkaline in reaction, as the presence of free acid would be apt to act injuriously on the paper. This can be done by the occasional addition of a few drops of ammonia, or, still better, of a small quantity of a strong solution of sodium carbonate. The resulting precipitate of silver carbonate soon settles to the bottom of the vessel, and tends to keep the bath clear by carrying down with it any floating organic matter.

The second class is represented by the ammonio-nitrate bath. This was formerly in great favor among photographers, and, although to a large extent superseded, still has some great advantages, particularly when used in the preparation of silver prints on plain paper. It is prepared as follows: The silver nitrate is first dissolved in the proper quantity of water; two-thirds of this solution is then placed in a separate vessel and strong ammonia added, drop by drop, until the precipitate of oxide of silver at first formed is completely dissolved; the remaining third of the solution is now added, and as this causes a slight precipitate again, pure concentrated nitric acid is added cautiously, drop by drop, until this precipitate is just redissolved. Although increasing the sensitiveness of the paper and deepening the intensity of the prints, this bath is apt to be more easily discolored with use than the previous bath, owing to the separation of free organic matter and albumen from the paper. For prints on plain paper, however, it is particularly adapted, and will give results not equaled by any other method, the prints having a rich, velvety appearance. Paper sensitized on this bath does not need to be fumed.

The third class comprises baths which, in addition to the silver nitrate, contain also an alkaline nitrate, such as the ammonium, sodium or potassium salts. These salts act as absorbents of free chlorine, and also serve to prevent the paper from becoming excessively dry in hot weather. The following formula may serve as a type:

Silver nitrate	60 gr.
Ammonium or sodium nitrate	60 gr.
Water	1 oz.

Render slightly alkaline with carbonate of soda, or with ammonia A few grains of alum are also sometimes added for the purpose of preventing blisters. This bath gives excellent results with albumen paper, and for this purpose is probably to be preferred to either of the preceding formulæ. For plain silver prints it is much inferior to the ammonio-nitrate bath, and the prints seem to

lose considerable strength during the preliminary washings before toning. Paper sensitized in this bath also requires to be fumed before printing.

In sensitizing albumen paper in these different baths the paper should always be "floated," as it is termed, an operation sufficiently familiar to all photographers to require no description. Plain paper may be either "floated" or the paper may be laid flat on a clean sheet of glass and the sensitizing solution applied to the salted side by means of a clean swab of cotton flannel, or a camel's hair brush.

It may be remarked here that paper sensitized in either a bath of the first or third class should always be fumed; with those of the second class it is not necessary. In printing, also, the sensitized paper from the former must be printed much more deeply, as they seem to lose a great deal of intensity in the subsequent washings. In the preparation of plain silver prints with the ammonio-nitrate bath the writer has found such a small percentage of silver in the wash waters that but a slight reaction would be given to the ordinary tests of silver, thus showing that nearly all of the silver salt remained fixed in the paper, and consequently tended to deepen and intensify the print.

Having now briefly discussed the different forms of the silver sensitizing bath, it remains to say a few words regarding its care and preparation. First, as every sheet of paper sensitized robs the bath of so much silver, its loss must be made good, or in a short time the bath will cease to work properly. The bath must therefore be strengthened from time to time, and this is generally done after each day's work by adding an amount of fresh nitrate of silver, corresponding to the quantity abstracted from the bath, thus maintaining it of a uniform strength. The usual practice is to allow about 50 grains of silver nitrate for each sheet of paper sensitized, and if the amount of silver corresponding to the number of sheets used is dissolved in a few drams of water and added to the bath, and then the bath exposed to the light for a while, it will continue to work satisfactorily for a long time. The hydrometer is also used for determining the strength of the bath, it sinking to certain marks, corresponding to the number of grains of silver nitrate in each ounce of the solution. This answers very well for a solution of silver nitrate in pure water, but as the bath soon becomes contaminated with soluble salts and organic matter, the density of the solution increases, and the readings of the hydrometer in consequence soon become incorrect. The chief source of contamination to the bath is from organic impurities carried into it from the paper, in time causing a brownish or reddish discoloration of the solution. This must be removed, since paper floated on such a bath is unevenly sensitized and darkened. Several methods of purification have been proposed. One is to add a small quantity of kaolin to the bath, which is then well shaken up and allowed to stand in the sun. The organic matter is carried down by the kaolin as it subsides, and, after filtration, the bath is again ready for use. Another method is to add a small quantity of a strong solution of potassium permanganate to the discolored bath, and decompose the organic matter by its oxidizing properties. This is immediate in its action and quite effective, but is open to the objection of introducing

extraneous salts into the bath. Another plan is to add a few drops of hydrochloric acid, or, still better, a small pinch of salt, and the chloride of silver thus formed in settling to the bottom of the vessel carries all impurities with it. The best method, however, is to add a small quantity of a saturated solution of sodium carbonate, and then set the bottle containing the bath in strong sunlight. The action of the sunlight oxidizes the organic matter, and the carbonate of silver formed carries it down as it settles to the bottom of the bottle.

Should it, however, be found impossible to purify the bath by this means, the next resource is to the process of "boiling down," as it is termed. A porcelain capsule, or, still better, an enameled iron dish of convenient size, having been procured, the refractory bath is poured into it and then placed over a gas stove and gently boiled down to dryness. The heat is then increased until the contents of the dish are in a state of fusion and completely liquefied. The heat is continued for a short time until all organic matter has been thoroughly carbonized, and then stopped, and the dish and its contents allowed to cool, the latter dissolved in distilled water and filtered. The filtrate is then made up to the original measure of the bath with distilled water, and a dram or two of fresh silver nitrate added to make up for waste and loss.

It happens, however, in course of time that the silver bath becomes so clogged up with soluble salts, such as the ammonium, sodium and potassium

HEYN STUDIO
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chloride and nitrate, resulting from the chemical reactions occurring during sensitizing, that the bath will no longer work. It must, therefore, be set aside, a new bath prepared and the silver recovered from the old bath.

If the bath has been made according to the first or third class, all that needs to be done is to render the bath acid with nitric acid, and then add a strong solution of washing soda until the white precipitate of carbonate of silver ceases to be formed. This is allowed to settle, the supernatant liquid poured off, and the precipitate washed repeatedly until the washings are free from color and all soluble salts have been removed The precipitate is then drained on a filter, and the moist mass, filter and all, is placed in a dish of porcelain or enameled iron and dilute nitric acid (one-tenth of water) added until effervescence ceases and the white precipitate is nearly entirely dissolved. This solution is then filtered and evaporated, first to dryness, and then heated to calm fusion and allowed to cool. The resulting semi-crystalline mass may be considered as pure silver nitrate, and when weighed will indicate what amount of water is to be added to form a bath of the proper strength.

If the old silver bath, however, is prepared according to the ammonio-nitrate formula, this method will not answer, as in the presence of the ammonia salt not all the carbonate of silver can be precipitated. The best plan is, therefore, to acidify the bath as before with nitric acid, and then add salt until all the silver is precipitated as chloride. This should be well washed, collected on a filter and dried. It may then be converted into pure metallic silver by fusing it in a crucible with powdered charcoal and nitrate of potassium, or it may be placed in a vessel containing dilute sulphuric acid (one-twentieth or one-thirtieth of water) and metallic zinc added. Metallic silver will be precipitated in a very finely divided state and the zinc dissolved. From this silver the nitrate can be prepared by dissolving it in dilute nitric acid and then proceeding in the same manner as described for the carbonate of silver.

"NIAGARA FALLS" S. T. MOREY

STEREOSCOPIC MOTION PICTURES

THE human mind is never satisfied; it is content with neither the ill nor good that it has, but strives constantly towards others that it knows not of. The motion picture has been brought to a high degree of efficiency, but further improvements are being earnestly sought, especially the production of natural colors and stereoscopic effects. The latter problem has been engaging active attention lately in France, and a recent issue of *Photo-Revue* contains a reprint of an article of one of the journals specially devoted to motion picture matters. In this article the more important methods that have been suggested are briefly set forth. The subject is of sufficient interest to justify a translation of the article. The author is Pierre Ulysse.

About three score French patents were taken out between 1900 and 1914 in this field. They may be conveniently classified as follows:

Stereoscopes, properly so called.
Viewing apparatus.
Methods by means of a succession of stereoscopic images.
Methods by means of superposition of stereoscopic images.
Mesh screens. Plastic effects. Miscellaneous.

The stereoscopes were essentially individual appliances and are not, therefore, strictly within the motion picture field, the object of the latter being to show the image to a group at one time. Apparatus of this first class was that of the Lumière Brothers, in contradistinction to the kinetoscope of Edison. For such apparatus patents were taken out by nearly twenty persons.

The general principle of the second class of apparatus is to project on the screen two images (taken stereoscopically) in complementary colors. Each person views the screen through a pair of glasses colored to correspond with the images on the screen, care being taken to place these glasses so that the colors are in the same relative positions as the colors projected, that is, if the red image is on the right-hand side of the screen, the red glass must be applied to the right eye. Each eye sees only the image which accords with its position, and hence the effect is one of correct relief. Though some of the patents taken out on this principle are a score of years old, little, if any, practical application has been made of the method. It is probable, indeed, that a good deal of eye-strain may be caused by the method. Some inventors have suggested a sort of movable diaphragm, analogous to the shutter of the projection machine, but such apparatus is rather startling, and our author thinks it better fitted for an operating room than for public exhibition. Nearly a dozen inventors have, however, labored along this special line.

Method three, that of rapid succession, has been thought by many to be the solution of the problem. It was thought that if a series of stereoscopic pictures could be displayed on the screen in very quick succession, the sensation of relief would be given. The theory is fundamentally erroneous, and, in fact, in direct conflict with the principle on which the motion picture is operated. The projection in succession of pictures taken from points at a distance equal

to the average distance between the eyes can have no other effect than to produce an apparent vibration from one side to the other between the two extremes. Notwithstanding these facts, the author of the article enumerates nearly a score of patentees of machines embodying the method.

Somewhat akin to the above is method four, in which the exact superposition of the two stereoscopic images is employed. Here, at least, there will be little confusion; the exactness of the superposition will be greater in proportion as the images approach in form, and, therefore, less stereoscopic, but, as a matter of fact, no stereoscopic effect will be obtained as far as the spectator is concerned. To produce the effect of relief, it is necessary that each eye should see the image that concerns it. Several patents along this line have been granted, and one inventor tried the plan of superposing several negatives on one point by changing slightly the position of the camera during the exposure.

Mesh screens. A patent issued to the Propognet Company covers the projection of two superposed images on a network with fine meshes. Each eye views a somewhat different part of the screen components, and as both images are partly concealed, a spectator suitably placed will see, with each eye, only a single image. Unfortunately, the position of the spectator is, as is easily seen, of primary importance, and it will be very difficult to provide for a number of persons, especially when scattered over the theater.

So-called "plastic" effect. This method in one of its forms designated "Plastiken" brings us into the domain of the side-show. Several inventors have developed a method of projection by which the pictures are thrown on a clear glass plate placed at an angle of 45 degrees, while back of the glass the stage is set with suitable scenery. The figures photographed should be in white clothes for stronger contrast. The scenery is visible through the glass with the moving figures projected on it. One patent seems to relate especially to a screen made up of three materials and another covers the use of a rotating screen with apertures.

These arrangements are essentially those of "Pepper's Ghost," an illusion which was devised many years ago by J. H. Pepper, of London. It was shown in a side show at the Philadelphia Centennial Exposition of 1876.

Miscellaneous methods. One method is to obtain images from different points of view by means of mirror movable in a plane parallel to itself. Another is a procedure for obtaining views in colors by interference by oblique light on an ordinary paper positive. It seems that it will be necessary to dispose the projection apparatus so that the same interferences may be made in the projection as in the original exposure, a condition which suggests the well-known Lippmann process. Another patent claims the use of a film in which two (lateral) pictures, taken at the stereoscopic distance, occupy the place of one ordinary picture. The claim that such a film can be properly projected by a single objective is regarded by the author of the article as unfounded.

From 1913 to the present time a great many patents have been taken in this same field, employing, for the most part, special screens from which an effect of relief is expected, but not attained.

SPECIAL APPLICATIONS OF CARBON PRINTING

THE general impression in connection with the carbon process is, firstly, that it is a permanent means of printing; secondly, that any desired tone, or rather color, may be obtained with certainty and with no extra work, and thirdly, that the prints have a certain transparency and quality which is lacking in most images produced with the salts of silver. Another very important point is that almost any smooth surface, such as wood, metal, glass, or, of course, paper of any color and almost any surface can be employed as a final support.

This point was made very clear to us when looking through a collection of specimens made by a veteran carbon printer, who took more than a mere pecuniary interest in his work, and delighted in showing the full capabilities of his beloved process. One of the most striking exhibits was of silversmith's work, such as presentation plate, race cups, caskets and the like transferred or developed upon the special silver-coated paper made for the purpose. This paper is made for single transfer only, but may be used for double transfer by means of the usual transferring solution of gelatine and chrome alum. Some of the best prints were done in this way, collodionized glass being used as a temporary support, and the result being, of course, highly glazed.

In some the effect of gold was obtained by the use of a yellow-tinted collodion, a "dodge" which was patented by Sir Thomas Parkyns in the early "eighties." From metal-surfaced paper to metal itself is an easy step, and some miniature reproductions of memorial "brasses" on plates of brass, bronze or copper gave an astonishingly good idea of the original. The brass, we were told, was coated with a substratum as used for double transfer opals and the finished picture protected with a celluloid lacquer. An interesting development of this was shown in a reversed print on stout brass for the bookbinder's block cutter, the artist's design being reduced to the exact size desired and reversed in the one operation. In this case an ordinary negative was used and the print made by single transfer.

Prints upon ivory or celluloid for the miniature printer are in common use, and do not call for any special notice, but few realize how beautiful a tiny red chalk monochrome on ivory is with little or no hand-work upon it. The cost is small and the result cannot fail to appeal to a customer with refined tastes. Another specimen was on the lines of the old crystoleum process, a single transfer print being made upon a piece of thin, white glass and backed up by another print, non-reversed, upon paper. This latter print was carefully colored by hand. The effect was far better than that of the ordinary crystoleum, and although the print was over twenty years old, there was no yellowing or fading. Window transparencies and slides for the lantern and stereoscope can be produced with great ease by the carbon process, care being taken to employ the special transparency tissue, and to use it soon after sensitizing.

Vigorous negatives are necessary, but almost any decent one will give a print capable of intensification with permanganate; as the high lights are bare glass there is no risk of any general staining or after-discoloration. Wooden panels or tablets afford an excellent support for certain subjects, portraits being rarely successful, but reproductions of bold drawings in pen and ink and one of poker work were particularly charming.

So far as we know, photographers who now specialize in out-of-the-way carbon work are rare, but it would seem that many professionals might take up one or two of the styles which we have described, particularly those on metallic surfaces, while the choice of color obtainable by the use of home-made transfer papers should give variety to the specimen display at little expense.

As a rule, the reversal caused by the single transfer process is a disadvantage, but there are occasions when it is distinctly useful. For example, we were shown a number of negatives of native African scenes which had been taken with a reversing mirror to avoid attracting notice. Their owner deplored the fact that his photographer insisted upon making enlargements of them in order to correct the reversal; as he did not happen to be a carbon printer the idea of single transfer prints had never entered his mind. Once the suggestion was given it was, of course, quickly acted upon. When a pair of pictures are wanted to face each other, and both negatives happen to have the head turned in the same direction, the difficulty is easily surmounted by printing one picture in single and one in double transfer.—*The British Journal of Photography.*

CONCERNING THE TERM ART

WHAT is generally understood by the term "Art"?

We use it in a variety of ways. We even speak of the noble art of self-defense, and we use the same word in talking about a painting or a piece of sculpture or of architecture, of music and of poetry, and we photographers dare even to talk about photographic art. It seems to connote something requiring exercise of the intellectual facility, but essentialy the faculty called into requisition is that which gives a peculiar phase of enjoyment, the æsthetic feeling. But all the various modes of æsthetic enjoyment differ from one another; they seem essentially unlike in the address to different senses, yet in some points all are alike and all are comprehended in the abstraction, "Art."

What is this inherent quality exhibited alike in all?

We acknowledge it, whether we are contemplating stone in sculpture, canvas in painting, sounds in music, words in poetry and dare we say, chemical stains on a piece of paper?

What does this "Art" do that makes its action so different from other mental operations?

We make some headway in a study if we get an intelligible conception of what that study is capable of.

Let us try to get this conception of what art really does.

In this life of ours we do two great things (sleeping and eating excepted).

we work and we play. That is, every power we call into exercise is either useful or delightful.

Our pleasure or play is the reflex of our work. But then, every motion of our muscles which we constrain to perform our labor is intended ultimately to give us leisure for pleasure.

We rush at full speed on serious intent to catch a train to get quickly to serious business. We call this work, but we spend just the same muscular activity if we take a journey for pleasure.

We apply our mental powers to mathematical or scientific analysis, but use them also in solving a foolish puzzle.

But is it not clear to you that all the serious activities of man fall into certain large classes and each class has its own peculiar methods?

But where does Art come in? Is the fundamental doctrine true that all art is merely play because it exists solely to give us pleasure?

It would seem so, but does this admission imply that the artist is simply one whose sole purpose is to amuse himself?

Anyhow, there is this difference between him and the mere idler or self-pleaser.

The artist amuses others while he amuses himself, and so he is a worker as well as a benefactor, a purveyor of joy to the community.

We commission the manufacturer to supply us with goods we want for comfort and enjoyment, because he does the performance better than we could do it ourselves; contributes better to our satisfaction and delight, and so this same division of labor is extended to the artist.

He explores for us the realms of joy, discovers and brings home to us things which give us pleasure.

His reward is not only in the satisfaction he has in being the agent for the community's delight, but also in the self-gratification experienced in being the maker or creator of something. This puts the artist far above the mechanic or merchant whose purpose in making, is self-gratification.

A little money and a good deal of shrewdness and perseverance will insure the mechanic or tradesman success, but the artist's capital is the gift of nature, a capital not to be transferred, a business that cannot be sold for remuneration.

Is it not a glorious prerogative to be the minister of Nature for the distribution of joy? The artist thus becomes a moral teacher, influencing humanity by the exercise of a function endowed on him by Nature.

There is a dignity in his profession which elevates him above that which ministers solely to material necessity.

His is an exalted and refined pleasure or play which grows the bigger, the further it is extended.

OBSERVATION ESSENTIAL TO PICTORIAL SELECTION

IT IS a common error to suppose that because we have a good sense of vision that we see things correctly and in proper relation. We willingly admit that the ear must be trained to appreciate harmony of sound, but presume that the faculty of appreciation of color harmony of the artistic effect produced by coördination of lines and association of masses of light and shade, is an inherent faculty of universal endowment.

Because we delight in the sight of beautiful things in nature, we, at once, jump to the conclusion that we have the artistic sense.

Were we asked the question, put by Ruskin: What is the difference between the trunk of an oak and the trunk of an elm? In what way do the branches of a pine tree grow? Are grasses and green leaves dimmed or brightened by clouds in the sky? our answer probably would be an evasive one to hide our ignorance. We might say: We are not naturalists.

Most of us would be compelled to confess that we have never accurately noticed the essential appearance of things, even such as are most common, but have taken in only casual impressions and can give only an approximate report of our visual experience. Yet, withal, we think that we have ability to determine with a glance what, in nature, is best suited to the purpose of art, that we instinctively assume the faculty of making a picture, or a dozen, on some sunny summer afternoon. Of course, it is not contended that profound acquaintance with the phenomena of nature is essential, even such as Ruskin deplores the general lacking in, to make or enjoy pictures, either with brush or camera, but there is necessity of cultivation of the power of observation in artistic selection.

The pointing of the camera at any scene which obtrudes itself upon our vision because of its attractiveness does not signify exercise of taste in selection.

Every composition, worthy of the designation, "pictorial," must present some reason why it has been selected, in preference to other transcriptions from nature seemingly of equal artistic attractivenss.

It is a well-known fact that certain associations of lines and oppositions of masses of light and shade, for some reason, are more pleasing to the eye than are others.

Philosophers have spilled a good deal of ink in trying to find the reason therefor. But let us possess ourselves in patience it is so, for it suffices us to know that the reason for the pleasure from art resolves itself into this: The eye delights to see unity in variety, the subordination of the many to one, and in the discovery of the ingenuity of the artist in the manipulation of these elemental parts, to an expression of his idea or conception.

This further amounts to saying that every picture must have a motive, a reason for its being. There must be something in the picture which makes apparent to our vision the reason for the pleasure it gives.

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Atmospheric Effect

In the painting or photographing of scenes from Nature it is the great endeavor of the painter to overcome any appearance of flatness in the transcript—that is, any adhesion of one passage to another, and it should, therefore, also be the aim of the photographer who aspires to pictorial presentation.

The photographer, to be sure, has not the same mechanical facilities as the painter to express what is called atmospheric effect in his picture, and must essentially depend upon the conditions of the atmosphere as actually existing. To get such effect, he must work during the prevalence of a considerable amount of haziness and secure the desired recession of the passages of the view.

In a view thus especially endowed by Nature the eye is sure to be led into the distance and in passing over the different receding passages derives much artistic pleasure from the journey. It is a sort of deception carrying the attention from the more pronounced or greater emphasized foreground to the extreme horizon. That is, a sort of transformation is effected in the view, which without this atmospheric conditions may not have possessed sufficient inducement to the pictorialist.

Even where the scene is not an extensive one atmosphere plays a very important rôle, because the subject is furnished with a comparatively quiet background with no distracting detail to call off one's attention from the principal group demanding special consideration.

The great difficulty encountered by the artist with the camera, where a scene is presented devoid of atmosphere, is in the viewing of the subject as a whole, the eye being equally influenced by a multitude of objects and details with the same impression. This is not only distracting to the artistic sense, but it also deprives the mind of that gratification in searching out the beauty of that which is not so apparent.

It is not desirable to have in the picture all the mystery of it thrust directly upon us. We ought not to see at a single glance the purpose and intention of the subject. To be sure, it demands taste, feeling and sentiment to produce such effects, but without such qualities our work is not entitled to be regarded as picturesque.

It is possible, even where all material presented to our artistic manipulation is close to the vision, to get mystery or sentiment or feeling, whatever you may choose to call it, in your picture.

In interiors and figure subjects and, indeed, in portraiture, where the atmosphere can hardly be said to be present, our purpose may be attained by obscuring in shadow, in greater or less masses and depth, those portions which may be artistically depressed or not revealed too clearly. This does not mean, however, that the photographer has a license to run into vagueness and unmeaning expression.

It is quite possible to have detail, but carefully handled detail, all subdued so as to necessitate some search for it—that is, detail subdued which still plays its part, and an essential part, but is not too pronounced or emphatic. Here really the artistic photographer has a more pliable subject to handle than the painter, because it is much easier to depress by the illumination, self-assertive detail than to do it with the brush. The exercise of the greatest judgment is demanded of the painter, but the photographer may adjust relations simply by interposition of screens, etc.

And so we never feel entirely justified in giving commendation to the camera pictorialist, even where his work, judged by strict artistic canons, suggests the production of the brush, when his picture shows palpable evidence that he has had recourse to the painter's method of depression, because, although the effect may be good, it is never as good or as enjoyable as that made by the legitimate depressing methods by skilled management of illumination. We must confess that the great hinderance to the photographer in his search for the pictorial is in the modifying or reconstructing unpleasant forms, and in the subduing of obtrusive lights. Where he encounters

right-angled forms, or ill-shapen areas of any kind, they are so apt to get into violent contrast of dark and light. Indeed, some subjects are wholly impracticable on this account and must be rejected, despite the possession of other artistic features. This is one of the unfortunate limitations of camera art. But the pictorialist has great facilities presented in the shape of greater range of selection than the painter. The production of a really fine work of art even by the painter is not so common. We do not expect him to be prolific, and why should the cameraist be so over-ambitious to get a multitude of really beautiful subjects? The painter is up against many disappointments, even after months of strenuous thought and work, and must hide many a failure. It is better to make a few things of particular worth than to throw off mechanically a hundred of mere mediocrity.

Utility of the Ugly

Nature, as a whole, is beautiful, but there are objects in Nature, which viewed as isolated parts, seem essentially antagonistic to beauty, and the conviction is forced upon us that Nature is sometimes unsightly, nay, positively ugly. But things are ugly only because they are viewed by themselves, individually, not in connection with the whole. By association they are the discords introduced to heighten by contrast the effect of subtle harmony, resolvable perhaps in the proper connection to other harmonies where they fit in.

Nevertheless, that man is lacking of artistic appreciation and had best throw away his brush, burn his canvas or chop up his camera, who persistently chooses only these isolated oddities, because they are of Nature.

Vice is a concomitant of virtue, but this is no excuse for vicious habits, although possibly in the divine scheme vice may be resolvable.

Artistic sense is manifest in the quick perception of harmony, not in the mere record of discords, and it is the duty of the artist to wrestle with what we call human ugliness and to endeavor to tone down the asperities of humanity by artistic modulation.

There is no face so ugly but that it may not be improved by skill in manipulation of the illumination, and the effort should be made, if for no other reason than for the intense satisfaction had in conquering difficulty.

Elemental Bodies

When the chemist submits the various compound bodies found in Nature to certain operations, he finds that he is able to change their character and to resolve them into their component parts. With further action upon these components, he finally reaches a condition that whatever action in a chemical way he brings to bear upon these ultimate parts, he is unable to effect a further change.

He classes these irreducibles as simple bodies and calls them elemental. They form the basal structure of the universe and from their almost unlimited combinations arise all the inorganic and organic bodies with which we are familiar.

But when physical changes were tried, these seemingly elemental bodies changed in appearance and behaved differently, and chemists began to get the idea that elements were not really the simple irreducible things they seemed to be and that it might be possible to further reduce them and change their nature. Hence the dream of the alchemist began to be looked upon as not so visionary as it was once pronounced to be.

Imagination often leads the way to discovery where prying investigation has failed.

Kepler and Newton are examples of minds who attained to hidden truths by pure mental process. So, too, the idea long prevailed that all bodies, supposed to be simple, must be derived from some one single substance, and the variety of things was a mere differentiation due to difference of conditions of environment.

For lack of experimental evidence, however, it remained a vague conception, to be reviewed in the present age clothed with verity by the discovery of the dissociation of matter.

Chemists had noted from an early date that the atoms of the most dissimilar bodies had certain properties in common, and so they naturally associated such together. They saw the close relationship, for instance, between chlorine, bromine, iodine and fluorine.

But the most important fact substantiating the relationship is found in the identity of the specific heat and of the electrical charge, when, instead of with like weights of matter, we work with quantities proportional to the atomic weights.

For instance, the quantity of heat expressed in calories, which has to be com-

municated to the bodies under discussion to raise their temperature the same number of degrees, varies with the amount of heat necessary to raise a kilogram of mercury by 97 degrees.

But if, instead of comparing equal weights, we compare weights proportional to their atomic weights, it is found that all bodies experience the same amount of heating from the same amount of heat source, while electrolysis proves that they carry an electric charge identical for the same atomic weight.

The existence of atoms and molecules is experimentally proved, but we still want to know something about their structure and interaction.

We want to know how a body is built up. How with the identical matter Nature can build up such varied structures.

Even our familiar metals, iron, silver, gold, etc., exist under specific differences.

We probably have genera and species in the metals.

We know half a dozen kinds of silver, for instance, each with marked peculiarity.

Spacing the Subjcct

Every picture, whether it be by the brush of the painter or by the rays of light entering the lens and impinging upon the sensitive plate, gives an impression of some natural object upon a flat plane and, therefore, has only length and breadth and yet it suggests the third dimension of space. So it is really in the power of the artist to suggest to the imagination the idea of depth or solidity.

How is this done? What are his illusory methods by which he really deceives the eye into a belief that it sees the third dimension of matter? His first business is to so construct his picture by determining the relation of lines and the association or opposition of masses of light and shade that they may excite that peculiar faculty of the visual sense which may be called tactile vision, or the power which the eye has acquired by experience gained through muscular action of determining that certain appearances of things indicate that they possess solidity. Now the artist must not only present on the flat to our eye the suggestion of solidity, but to affect us pleasurably he must do it also in a particular way. We must have this illusion of varying muscular sensation stimulated. What is meant by esthetic pleasure?

The enjoyment of pictures is quite different from the pleasure we experience when reading a beautiful poem or listening to music.

But it would lead us into too deep psychological analysis, even if we were capable of such analysis, to discuss the difference, and we may only say that the imitation of Nature in a picture delights us not because it is a perfect facsimile of the scene or object, but because our emotional sense is excited and a response is made by our intellect. The innate sense of the beautiful is gratified. We never experience such emotion when we view a group of excellently done wax work, though the most lifelike in externals of any mode of directly imitating Nature. It fails as an illusion or suggestion. It does not appeal to the imagination.

We started out to talk about spacing, but the subject enticed us into devious ways. However, what we said is pertinent to the subject in that our contention was that a picture must represent to the imagination the significance of form.

To get down to the subject definitely the harmonious arrangement of objects in a certain limited portion of space is what the pictorialist must accomplish.

He must get harmony from apparent discord. When we look at our picture on the ground-glass we see what really is a synthesis of Nature, and the pictorial instinct comes in when we compare it with the conception we have of what constitutes artistic composition. That is, we exercise our power of selection, which is a kind of inventive talent and has as much claim in the direction of originality of conception as true constructive genius. It is true the photographer has not the same discretionary freedom as the painter in excluding what he considers discordant, but he may exercise his judgment and taste in subordinating what does not specially lend itself to Art.

There are, however, certain principles to be observed for securing the proper distribution of things to a harmonious relation. We shall here confine our remarks to portraiture, or we shall drift off again and land nowhere.

The exercise of artistic taste is even more demanded of the portraitist than of the pictorial landscape worker, because the slightest discrepancy in the modeling of the features will act like a discordant note and cannot be resolved as it might possibly be in a view.

No special rules can be given, nothing

formulated. And it is well that the artist cannot thus be forced, as it were, to be artistic mechanically.

No portrait artist can look for success if he is a slave to set rules. He must have an inherent taste and intuitive perception of what beauty is in portraiture before he can ask the assistance of rules and principles to carry out his idea.

Masterpieces of Art

There is frequent complaint that the technical phase of photography is but little considered, if at all regarded by the exponents of the art of today.

We, ourselves, have to plead guilty, in this particular, that our zeal for good craftsmanship makes us somewhat severe when we see palpable neglect of the observance of care in the manipulatory part of the art.

Successful outcome has been made so easy of attainment that the means for presentation of fairly good work, placed in the hands of the inexperienced, enables the photographer of artistic instinct to give expression to his sentiment sufficiently pronounced to satisfy the art critic, who is always lenient to technical shortcoming, if at all regardful of it when it exhibits the artistic equation.

When we come to look at the subject in an unbiased attitude, from the artist's angle of view instead of the technician's, we must appreciate that the artist is justifiable in his procedure.

There are many who now take up photography for no other purpose than as a means to artistic expression, possessing the talent but not the education incident upon the career of the painter, and who are grateful for the easily acquired operations of photography and willing to accord acknowledgment to those generous souls who thus immolate themselves as martyrs for art.

We have to acknowledge that the artist is and ever has been indebted to the patient investigator and that his art would be in abeyance, without the means science has presented.

Our present pictorial work would be impossible if the artist were hampered by the impedimenta of fifty years ago, and we would not have in our ranks the artists it can now boast of, nor would the painter be so appreciative of the art work of the photographer.

Many a one would be deterred from pursuing photography if presented with the obstacles once so pronounced, and our art would not have made the remarkable progress it has.

Now what is our purpose here in emphasizing the art phase?

It is primarily to call attention to some of the facilities accessible to the photographer who is by instinct artistic but without the education to make use of the means for aristic culture.

The concrete method appeals better to the uninstructed than abstract disquisition on art, and the actual picture is of greater value to illustrate what art consists in than all the extensive literature on the subject is capable of.

We have a little *orbis pictus* of the works of the distinguished painters, called "The Painters' Series," with no texts, *only illustrations*, in excellent reproduction, from the paintings by the masters—those who have been great in portraiture, landscape and genre. Here before our eyes we see how the pictures were composed, the means by which the subject is made pleasing to the artistic sense.

How the various lines of the compositions are brought to a unity of reaction for the expression of a particular motive.

Here the eye sees how the artist effects his scheme of light and shade, gets his values. Here, too, the subject of background is occularly exploited, how the grouping of figures must be managed. Here, too, the landscape photographer sees at a glance what is meant by artistic planes, aerial distance, atmosphere, suggestion of movement and repose.

In a word, the student is in a position to have at instant command a handy means of study of art at a very small expense.

Solution

Photographers are familiar enough with the phenomena of solution of a solid body in some sort of a liquid, but few, perhaps, ever give it a thought to inquire what really happens to the solid when placed in the solvent. The explanations advanced by chemists of the past were, by no means, convincing and received much criticism from practical workers as not explanatory of certain behaviors of the various substances dissolved.

Quite recently in the light of the new discoveries relative to this matter the discussion has again been taken up and some new ideas brough forward. We have come

to the wholesome confession that despite all our experience we know comparatively *little* about matter in the solid state.

We know definitely, to be sure, that it crystallizes in certain geometric forms or persists in an amorphous or shapeless condition, and we can tell how solids conduct the different forms of energy, heat, light and electricity. But here we stop and are unable to say anything reasonably why certain crystalline forms should be taken in preference to others. We do not know the simplest laws to which solid matter conforms. Literally, we do not know what is the molecular structure or chemical formula of solid sodium chloride (common salt) or of solid water (ice).

We can only tell you something about these solids when we get them in the liquid form. We can then pretty accurately determine the molecular weights, but our knowledge of the laws governing liquids is not very extensive. It is only when we get the solids in the third form of matter—the gaseous—that we can speak more definitely of relations. Here we fortunately can apply mathematics.

Some little advance has been made in the direction of the relation between solutions and gases. Little as is this knowledge we look on it as the most important step forward toward some comprehension of the phenomena of solutions. One theory in brief holds that the minute particles of a body in solution obey laws like those governing gases. In dilute solutions the conditions approximate the conditions of those in the gaseous state, but concentrated solutions show deviations similar to those shown by gases under great pressure and near the point of liquefaction.

Yet if we take into consideration the fact that solids have the power of dissolving one another under certain conditions, then a solution may be a solid, and so the definition given above would be inadequate.

Arrhenius explains solution by saying that substances in aqueous solution are dissociated more or less into ions, this really holds good only for cases of very dilute solutions. It will not account for saturation or even for percentage solutions. The up-to-date explanation is about as follows:

The compound, say, of a chloride or bromide is formed by a union of a molecule of the chloride or bromide with a large number of molecules of the water and acts as a unit or as one molecule in lowering the freezing point of the remaining water. But the total amount of water present, which is now acting as a solvent, is diminished by the amount taken up by the chloride or bromide molecules.

We might ask whether a double salt, such as an alum, or a double chloride exists in solution as such; or whether it breaks down first into the simple salts which are supposed to compose it, and then these dissociate in the usual way. We are unable to find any very satisfactory response to this inquiry.

We can, however, easily see that a comprehensible and reasonable theory of solution would be of much value in the explanation of chemical phenomena, for solution is the condition of matter which underlies and determines chemical activity.

Chemistry is fundamentally the science of the action of the solvent upon the solid since we really only study matter chemically in this way.

An Appreciation

Stanhope, a distinguished painter of the middle period of the nineteenth century, in a letter addressed to his brother, also a painter (1841), urges him to collaborate with him in the "novel means" by photography of reproducing Nature. Along with other matter, Stanhope says:

"The particular purpose of this letter is to call your attention to the collotype picture." (This is the name under which Fox Talbot, the inventor, patented his method of producing pictures on paper.) "I have been making out more about them lately, and they are *the* thing, there is no mistake. I am perfectly convinced that the only way to succeed is by sticking to it, and devoting one's attention to it until the difficulties are gotten over.

"If you will take the chemical part of it I will undertake the arranging of the subjects, etc., in fact the artistic part, and in this way we shall produce great things.

"Do begin then directly when you get home. I will send you everything you need and all the stray information I can get hold of. We have already succeeded better than any others I have heard of in the little way we have done, and when I get home we will arrange or plan some projects which I have in mind. Lord Eastnor, who is a good hand at the process, has been illustrating a story by means of a series of Talbotypes, which Watts (another of the painters of the day), is uproarious about, and that is what I want to do, as no picture, however beautiful, can possibly equal them."

Antiquity of the Lens

The more we study the conditions of the ancient peoples, the more we discover their civilization was much further advanced than the mere records of conquests would lead us to think, the only motive of their historians.

From indirect sources and principally from antiquarian research, we come across reference to social relations differing very little from our own.

The poets, more especially the comic dramatists and satirical authors, frequently by incidentals referring to some usual practice of daily life bring the ancients in close kinship.

Of course, no trace has ever turned up indicating any knowledge of photography, although contact prints must have been incidentally formed by superposition of an opaque body upon some of the light sensitive colors used in decoration.

We have good reason to think that Vitruvins knew of the camera and no doubt the Assyrians and Egyptians understood the magnifying power of the lens.

If M. de Paravey is right, the ancient Chinese used telescopes 2000 B. C. The British Museum has a rock crystal plano camera lens, 1½ inches in diameter and seven-tenths of an inch thick, discovered in Babylon by Layard. Its focal length is 4½ inches. The Babylonian seals are covered with very fine characters admirably engraved, which undoubtedly were cut by using a magnifying glass to aid natural vision.

Plutarch refers to instruments employed by Archimedes designed to increase the image of the sun and the planets, and reference is made by Greek writers to the crescent form of Venus.

Euclid's Optus appeared about 280 B. C. and Seutonius tells us that Nero was near-sighted and used a sapphire monocle at the gladiatorial shows.

Aristophanes, the Greek comedian, in his dialogue between Socrates and Strepsiades, gives us the idea that the Greeks knew considerable about lenses. In the twelfth century, quite a number of treatises refer to lenses and the refraction of light. Vicellus, a Pole, wrote a book on lenses in 1270. Roger Bacon is generally credited with the practical introduction of spectacles in 1250.

The Floyd Vail Exhibit

C. H. CLAUDY

I have just come from the National Museum at Washington, D. C., whither I went to see the Floyd Vail collection of pictorial photographs.

Mr. Vail's pictures, forty-nine in number, hang in several large glass cases in the room devoted to the history of photography. They are flanked with exhibits of apparatus, of old processes, of civil war pictures, of pictorial examples dating back to the late forties. Above one of the cases is a card reading:

"An exhibition of pictorial photographs by Floyd Vail, F. R. P. S. Mr. Vail is the Chairman of the print committee of the New York Camera Club and an art writer of distinction. His pictures depict the spirit and mood of nature, and as such have few equals in pictorial photography."

The first impression made by the Vail collection is of the enormous progress made, not only by the processes, the apparatus and the science of making pictures with a lens and plate, but the great strides made by the men who use these things as tools of art. Mr. Vail's exhibition is of a more uniform degree of excellence, a higher standard of beauty, than any one-man exhibition I have ever seen. The artist-reader may justly inquire by what canons I judge, and perhaps by what right I assume the functions of the art critic. To which I reply, in all humility, that I do not consider even twenty-five years in photography and much study of art principles qualify me to be a judge of such work as this of Mr. Vail's, in any sense of determining its relative worth or his position among other artists. I do believe that just as the educated musician has a right to judge, and even to criticise, a performance he could never hope to equal, so to us who spend our lives in the study of, the writing about and looking at pictures, comes the right to form and even to express opinions, though no right to issue dictums as to the place such work occupies in the whole world of art.

Mr. Vail's pictures appeal to me as having a wonderful feeling for mass . . . more so than for line, though this is no criticism of his composition, which is nearly always faultless. But it is with mass and contrast, rather than with drawing and the perspective which comes from drawing, that he gets his effects.

Most of his pictures are landscape, or landscapes with water. A few are genre in character . . . and most skilfully does he use his models as masses as well as for living entities in his compositions. There are two large heads, both apparently posed by the same old man, one called "The Law and the Prophet," the other "Russian Immigrant," which do not do the artist, in Mr. Vail, nearly so much justice as do his landscapes. I found them rather flat, and not particularly convincing.

There are some interiors of what is apparently a museum, which are very unusual, both in the effectiveness in which unrelated objects are grouped and massed and in the lighting. One of them gives the impression of having rather too much "fuzziness" to be real, a criticism, by the way, which cannot be laid against the landscapes, sketchy as most of them are. For there is so much of real mist and real distance in these low gray toned exteriors that one loses all sight of the means employed in joy at the results.

Technically, Mr. Vail's work is the last word. So perfect, indeed, are his photographs as photographs . . . by which I mean exposure and printing and choice of paper and mounting . . . that this part of the beauty he has spread before the beholder is too apt to be overlooked. It is said of a man that he is well dressed, when no one notices his clothes; it can be said of these photographs that they are perfectly made, because no one not looking for the machinery behind, would ever think to comment upon what is so perfectly done as to be entirely unobtrusive.

Practically all Mr. Vail's work is pitched in a low key, but he combined a happy faculty of keeping dark shadows transparent without seeming to fill them with detail, and of keeping his high-lights in keeping with his general tone, without making them muddy. I notice this in many of his pictures, but in none more than in a winter scene in New York City, in which snow on the sidewalk and in air form the principle light, relieved by a few dark figures. Yet the figures are not unduly dark and the snow is of that dull, heavy whiteness which comes with a blizzard storm, a storm without any sun, or any suggestion of a sun. Rarely has work of this character been done more happily.

Mr. Vail has less feeling for stereoscopic effect in his pictures than some pictorialists, to which one picture offers a marked contrast. "October Morning" (which is not well titled) uses the silhouette of leaves on a branch in the near foreground against a distant sky with stereoscopic effect almost startling, and without that midnight charcoal blackness to the silhouette which is so much admired of the amateur, so much the anathema of the artist.

It is more of a literary than an artistic criticism, perhaps, to take exception to Mr. Vail's title, but I must e'en stick to my guns and reiterate my opinion that a picture which needs a title to explain it is less good than it should be. Mr. Vail's pictures do not need titles, and the tacking of hours of the day and month of the year on some of them is, to my mind, a false note. "Drear December" might as well be drear January or November, and several "mornings" and "afternoons" could change labels without in any way affecting the beauty of the picture.

But this, I am willing to agree, may be carping criticism. Mr. Vail has put forth forty-nine pictures in one exhibit, none of which are commonplace, all of which deserve attention and of which the worst which can be said is that the most of them are better than the few which are not quite up to the standard he himself sets.

His magnificent collection should, and it is to be hoped will, remain permanently on exhibition in the museum, at least until some more inspired genius displaces them with better ones.

Happening, in the opinion of ye present scribe, not very likely to occur.

Restoration of Manuscripts Injured by Fire

A. Bencke treats of this subject in the *Deutsche Lichtbild Kunst.* A preliminary condition of success in dealing with paper documents that have been much injured, is to make them flexible. This is accomplished by applying a thin varnish, such as is used in lead pencil re-touching work. The varnish should be sprayed on, so that the material can be spread out on a glass plate, and allowed to dry. Another plate is laid on and pressed down. If the material to be copied had been written by one of the iron inks, a photographic copy will show this as dark gray lines on a black ground. Ordinary plates may be used and long exposure given, yet over-exposure should be avoided. A slow working developer is to be used. Bencke recommends ferrous oxalate with bromide. If the writing or drawing has been done with India ink or with printers' ink, the photograph

will show the markings darker than the ground. If the ink used in one of the coal-tar dyes or vegetable colors, a different condition is encountered. Orthochromatic plates must be used with color screens. If, for example, the writing appears yellowish on a red ground, white lines will result when a red screen is used and black lines with a violet screen. If the writing on the original appears bluish or violet, a blue glass should be interposed and plates sensitive only for blue and violet (therefore not orthochromatic) may be used. With this arrangement white lines on a black ground are obtained. Reiss of Lusanne has recently discovered a method by which lead pencil writing on burnt paper may be made readable. The material confined between glass plates (as noted above), is placed at an angle of 60° to the optic axis of the lens and the light from a Welsbach mantle allowed to fall on the object at an angle of 30°, a condition, which of course, necessitates a long exposure. The writing appears dark upon a light ground.

The above procedures succeed pretty well when the damage has not been very great, but in many cases resort must be made to methods devised by Burinsky and Favorski, which will enable even faint traces of writing to be recovered. The procedure is as follows:

The manuscript, between glass plates as before, is placed in contact with a collodio-chloride plate and the progress of the action watched. As soon as traces of the image are seen, the printing frame is covered with a yellow glass, whereby the portion of the plate affected by light begins to darken, while the other portion remains unchanged. The transparency thus obtained is fixed, washed, dried and coated by means of a solution of rubber. It is then replaced in the frame, covered with the yellow glass and re-exposed. In this an intensification of the writing is obtained. Somewhat better results are obtained if a small amount of chromic acid is incorporated with the collodio-chloride emulsion. If this does not suffice, it is recommended to make several negatives on wet plates and after stripping off the films superpose them accurately. Burinsky uses, in certain cases, five or more films together. Such plates serve to make a positive on glass. This procedure is dependent on the peculiar action of silver salts upon carbon paper. If we impregnate gelatin-carbon coated paper with bichromate and potassium ferricyanide and place this on a silver picture of the object copied and then dip the sheet in warm water, the gelatin will become insoluble at all points at which the silver image touches it, the depth of the action being proportional to the intensity of the silver image. A contact of 20 or 30 minutes generally suffices, when the whole is immersed in water at about 100° F, by which the soluble gelatin is removed. On removing the papers and separating them, it will be found that the original silver picture is overlaid with a strengthened image, although the silver picture itself is weakened, as it is converted into a ferricyanide. Two pictures are obtained in silver and pigment respectively that mutually strengthen. By immersing the silver picture in a suitable developer the silver salt is converted into metal. A third picture can be obtained by using another sheet of carbon paper, and even more. Favorski employed a bath having the following composition:

Water	600	c.c.
Potassium bichromate	5	grams
Potassium ferricyanide	4	grams
Potassium bromide	4	grams
Chrome alum	1.75	grams
Citric acid	0.6	grams

With such a bath the highest effect of contact is obtained, and the image thus obtained serves to produce a gelatino bromide positive that can be intensified by the ozobrome process. The process is continued until a legible wrting is obtained.

These investigations lead to an application of photography to a useful field.

Multiple Negatives for Photo-Lithography

In making up a printing plate for an offset machine, of small units, the necessary number can be obtained by repeated exposures on the sensitized plate; laying the negative each time upon register marks, corresponding with marks placed on the copy for the purpose, and shielding the extra surface of plate from light-action during each printing down.

This method answers well when the units are large and the multiple printing does not exceed eight, but when small labels, stamps, etc., where the completed print does not exceed 6 x 4 ins., are to be done, then a step and repeat machine is required, especially for fine color work.

When the units are larger, multiple negatives may be built up of negatives made upon Transferotype paper, trimming to exact size, and transferring the requisite quantity to a

large sheet of glass, giving a large negative made up of a number of smaller ones.

First of all, make from the original a negative the exact size of the unit, or label, required. From this negative, make a positive by contact, and from this positive make the requisite quantity of small negatives or prints upon Transferotype paper to fill up the printing plate.

The copy negative is best made by the wet collodion process, the contact positive upon a process dry plate, developed with the following hydroquinone developer:

No. 1.

Hydroquinone	180	grs.
Potass. metabisulphite	½	oz.
Citric acid	60	grs.
Potass. bromide	60	grs.
Water	20	ozs.

No. 2.

Caustic soda	180	grs.
Water	20	ozs.

For use, take equal parts of No. 1 and No. 2. Fix in:

Hypo	6	ozs.
Water	20	ozs.

This developer is also used for developing the negative prints made upon the Transferotype paper.

The transparent positive may be fixed in an acid hypo bath, but the Transferotype negative prints must be fixed in plain and freshly mixed hyposulphite of soda.

Care must be taken all through the process that the lines are clear glass in the case of the negatives, and in the positive that the lines are quite dense, and the other parts quite free from veil.

The negative prints made under the positive must have all the characteristics of a good line negative, viz., the lines quite white, and the ground perfectly black. Using a contrasty Transferotype paper, giving it the proper exposure, and developing with the formula given above there will be no difficulty on this point.

The negative prints when dry should be trimmed exactly to size, allowing in this for a slight expansion when again wetted.

This fact of expansion when wet, inherent to all paper prints, suggests that unless some means are adopted to prevent any expansion, the use of paper for making negatives for color work is not practicable. This is quite true, but for ordinary black and white labels, etc., this expansion is quite negligible.

Fortunately the trouble can be obviated quite easily by soaking the paper in clean water until limp, then squeegeeing down upon a sheet of glass that has been previously thoroughly cleaned and polished with French chalk, or what is perhaps better, first smeared with vaseline, polished off, then dusted with French chalk and polished until this is quite polished off. Once this is done the plate will be usable quite a dozen times without repolishing; even then only a French chalk polish is necessary.

The sensitive Transferotype paper, wetted till limp, is then squeegeed into contact with the glass, and dried (in the dark-room, of course, and also the soaking and mounting on the glass must be dark-room operations). When dry, the paper is stripped off the plate and cut up into sizes for printing upon. Paper dried as above is at its full stretch as regards both dimensions, and cannot expand any more either way, so that small negatives made upon such stretched paper may be relied upon to give good register.

The prints being made and trimmed to size are next wetted until quite limp. They are then assembled upon a sheet of British plate-glass which has been previously coated with:

Gelatine	2	ozs.
Water	20	ozs.
Potass. bichromate (saturated solution)	1	dr.

Filter before use, and coat whilst warm. The glass plate is scrubbed, and well washed, and then coated with the above solution, drained, and dried in full daylight.

When the prints are assembled (having plenty of water on the plate, which is best laid flat), place a sheet of rubber cloth all over the prints and squeegee down lightly. Remove the rubber cloth, and carefully examine the prints, and by the aid of set square, T-square, and straight edge, coax by slight touches all the prints into exact positions. Again cover with rubber cloth, and squeegee as hard as possible. Keeping the rubber cloth in position, erect the glass plate, and finally examine the negatives. If any are displaced, the remedy is easy; they are still movable sideways, may be removed bodily, rewetted and replaced. After the final squeegee, place a sheet of glass upon the rubber cloth and leave under that pressure for an hour. Next immerse the plate in water at a temperature of about 110 deg. F., and in a few minutes the paper backings may be lifted off. Now gently lave the water over the negatives so as to get rid of superfluous gelatine, wash for a few minutes in cold water, drain and put away to dry. After draining 10 to 15 minutes, examine the films, and if there are any tears, remove them by dabbing gently with a damp chamois or with fluffless blotting paper.

For poster work, enlargements can be made any size up to 60 x 40 upon this paper, and the print transferred to a glass plate for printing down upon metal.

The plates upon which these prints have been transferred can be made available for other negatives by soaking in an acid pickle, then washed and recoated with the bichromated gelatine.—*W. T. Wilkinson, in The British Journal of Photography.*

Development of Silver Chloride Emulsion Paper

A method for chemical development of silver chloride emulsion dates back to Wharton Simpson's time, but it was only on the introduction of emulsion papers, that practical formulæ were given by Pizzaghelli and subsequently improved by Eder, Valenta and others.

Certain photographic papers on development with alkaline hydroquinone, ferrous citrate, etc., gave successful results.

These papers, however, were those prepared with excess of alkaline chlorides and were not, therefore, suitable for direct printing-out, but only for development (enlargement) papers. But papers which are specially intended for printing-out purpose, which contain excess of soluble silver salts, may be used for the preparation of pictures by means of development, without the results which we had (when specially treated) being distinguishable from directly printed images from a negative, and with the advantage of the saving of much time, especially when the light is weak and the negative dense.

1. The time of printing may be reduced to one-fourth (with normal negative).

2. Artifical may be used (magnesium electric) with good tones.

3. By use of certain developers, tones may be secured not possible by printing-out.

4. Any degree of intensity of image obtainable by development of faint impression or completely printed-out picture. Gallic acid with sodium acetate and lead-nitrate were at first employed and the results were good but not possible with all the grades of commercial papers. Developers containing the gallic acid besides, are liable to deteriorate and the whites of the picture, sometimes, are clouded over.

The method of Valenta of developing faintly printed-out images on various commercial papers permits the use of other developing agents than gallic acid and furnishes results beautiful in tone and clearness.

His method consists in the use of acid developer with pyro or hydroquinone as the reducing agent. Neither of these agents can be used in connection with alkalines, but give in conjunction with neutral sodium sulphite and citric acid or other organic acids, tartaric actetic, etc., very satisfactory development.

A. Hydroquinone	150 grains.
Alcohol	4 ounces.
B. Sodium Sulphite	2 ounces.
Distilled Water	20 ounces.
Citric Acid	80 grains.

Dissolve the acid before adding it.

For use take 1½ ounces A, 1½ ounces B to 34 ounces water.

Pyro developer or the following formula:

Distilled Water	34 ounces.
Sodium Sulphite (Gran.)	2 ounces.
Pyro	150 grains.
Citric Acid	160 grains.

Dissolve the citric acid before adding to the solution. The chemicals should be dissolved in the order indicated and the clear solution used immediately.

The hydroquinone developer works, works slower than the pyro and the solution should not be below 70 degrees F.

The prints are toned and fixed at the same time in

Distilled Water	17 ounces.
Hypo	5 ounces.
Ammonium Sulpho-Cyanide	230 grains.
Alum (plain)	300 grains.
Acetate of Lead	750 grains.

Dissolve the lead before addition and heat the solution in a water bath to about 140 degrees F. A precipitate forms and the solution must be filtered from it and 100 parts of it mixed with 50 parts of distilled water and 10 parts of a one per cent. solution of gold chloride. The tone obtained is first a rich brown which on continuation of the action changes to a beautiful deep purple brown. Stop the minute the tone desired is reached. It is to be observed that the washing tends to deepen the tone.

Both these developers keep well in a stoppered bottle for about a week.

Liesegang found that the Valenta developers worked well with all papers but aristotype paper and recommends therefore for this paper his developer which is somewhat analogous to the old galtic acid developer.

A. Pyro.

Solution of Pyro 7%...	2 parts.
Solution of Sodium Acetate 20%	10 parts.
Citric acid, 15 grains dissolved in a little water.	
Distilled Water	50 parts.

B. Paramidophenal Developer:

Solution of Paramidophenol 7%	2 parts.
Solution of Sodium Acetate 20%	10 parts.
Citric Acid (15 grains in a little water).	
Distilled Water	50 parts.

Eder and Valenta, however, found that the Liesegang formulæ were not applicable to any of the other commercial papers and besides the solutions, quickly decompose.

They therefore recommend the hydroquinone or pyro formulæ, as given above or modified.

For red and violet tones, take:

Water	34 ounces.
Hydroquinone	230 grains.
Citric Acid	50 grains.

The faintly printed image is placed in the developer and during the development keep the solution in constant movement.

Wash well and tone in the combined bath. The final tone is purple black. Wash well finally.

Pyro develops quicker and is easier to work, giving dark violet to black tones, fine for enlargements.

Pyro	20 parts.
Water	1000 parts.
Citric Acid	16 parts.
Sodium Sulphite	50 parts.

Paris Notes

DESENSITIZER

At the October meeting of the Scientific Section of the French Photographic Society, M. J. Desalme made a preliminary announcement of the desensitizing properties of the alkaline salts of picramic acid, which, for want of time, he had tested on bromide papers. Picramate of soda, when used as a desensitizer of plates, requires to be employed in much stronger solution than safranine, but, on the other hand, has the advantage of being much more readily washed out from the gelatine film or the skin. Samples distributed by M. Desalme among his fellow-members will allow the latter to test the product for themselves. At the time of writing, these experiments are not complete, and have been made only on ordinary (non-ortho) plates or those sensitive to green, but they show that a 1 per cent solution of picramate of soda has a desensitising action slightly inferior to that of a 1:2,000 solution of safranine.

Recently a saturated solution of aurantia in acetone was placed on the market as a desensitizer, and has been the cause of skin affections, and even, in certain cases, of more serious poisoning. The harm results from the full exposure of the skin to the toxic action of the aurantia in consequence of the complete removal of natural grease. The aurantia desensitizer is now supplied in the form of a much less concentrated solution in alcohol. Nevertheless, it is recommended to observe care in avoiding contact of the skin with the solution, as sold. In case the solution is spilt on the fingers, the latter should be well rinsed with spirit. In the diluted state in which it is used for bathing plates, the aurantia solution is altogether harmless.

PRESERVING THE AMIDOL DEVELOPER

M. L. J. Bunel has recently drawn attention to the value of the addition to the amidol developer of commercial lactic acid (sp. gr., 1.21) in the proportion of 5 c.c.s. per litre (1 drachm to 25 ozs.). The chemical properties of lactic acid are closely allied to those of glycollic acid, recently recommended in the "B.J." (1921, March 4, p. 125) for the same purpose. Also lactic acid is more readily obtained and is equally effective, its preserving action being greatly superior to those of metol, advised not long ago by Signor R. Namias. M. Lobel has compared a developer preserved with lactic acid with one containing stannous tartrate, according to Desalme, also with one not containing a special preservative and with the usual MQ formula. An equal volume of each of these four developers were left freely exposed to the air in identical vessels. A band of bromide paper exposed under a sensitometric step-wedge was developed each day in each bath. M. Lobel thus found that the amidol developer without special preservative contained to develop only until the fourth day, but when preserved with

either stannous tartrate or lactic acid maintained its developing power unimpaired up to the eighth day. The MQ solution continued to develop up to the tenth day.

It is important to note that in normal conditions a developer which is kept in a corked bottle, even if only partly filled, retains its activity much longer. An amidol developer becomes strongly colored long before its developing power is exhausted. In the case of used developer, this change is still more marked, owing to the formation of colloid silver, and M. Lobel some time ago drew attention to a simple means of precipitating the colloid silver and thus prolonging the life of the developer. For this purpose addition is made of 200 gms. sodium sulphate to each litre of bath (1 oz. per 5 fluid ozs.).

THE AUTOCHROM PROCESS

Although many skilled users of the Autochrom plate do not admit any variation in its quality, others frequently experience a tendency to a slight predominant blue tint. It appears that those expressing themselves fully satisfied with the uniformity of the product at the present time are chiefly those who adhere to the pyro-ammonia developer recommended by M. M. Lumière on the introduction of the plates. Hence it seems that the tendency to blueness is counterbalanced by the color of the pyro image. Such tint, when it is not too pronounced, is counter-balanced by toning the image to a brownish color, for example, by uranium, or by binding up the transparency with a gelatine-coated glass slightly tinted in the complementary color, but it is better in every respect to obtain a perfect result without the use of these methods.

At a recent meeting of the Color Section of the French Photographic Society, M. Schitz, secretary of the Stero Club, showed a very fine collection of landscape Autochroms made during the summer. M. Schitz is one of the most active of our color workers and has adopted his own methods of dealing with Autochrom plates which exhibit a tendency to blueness. Preliminary tests showed him that with a lens aperture of *f* 7.5, the best time of exposure is exactly equal to the time required for the paper of the Imperial exposure-meter to darken to the standard tint, with the precaution that the paper is exposed to the light coming from the subject, excluding direct light from the sky. He puts his exposure-meter upright on the camera facing the subject, covering it by a piece of paper or card. He uncovers it when opening the lens and closes the latter as soon as the paper has darkened to the tint. During about a quarter of the exposure he holds against the lens a Wratten K1 filter film, in supplement to the action of the customary Lumière filter. The first development is done (after desensitizing) with amidol containing little bromide.

At the same meeting Dr. A. Polack, an opthalimist of repute, showed some impressionistic studies obtained with an anachromatic lens, the chromatic aberration of which was purposely exaggerated. The results were put forward as experimental, so I refrain for the present from commenting on them.

SOME NEW INSTRUCTIONS

The Société d'Optique at de Mécanique de Précision (S. O. M.) has just introduced a new *f*/4.5 anastigmat named the Flor, the front component of which consists of two glasses with an air space between them, whilst the rear component is formed by three cemented glasses. The corrections have been carried out to a very high degree, particularly as regards coma, and the lens has a remarkably flat field. The lens of 135 mm. focal length (= 5 5-16 inches) is designed for a 9 × 12 cm. plate, yielding a sharpness of definition of 0.1 mm. (1-250th inch) over a field of about 6¼ inches diameter, which is a quarter of an inch greater than the diagnoal of the plate. A sharpness of definition of 0.05 mm. (1-500 inch) is obtained over a field of 4¾ inches diameter. Owing to the favorable distribution of the corrections, the depth of field is distinctly greater than that which is customarily found in a lens of the same relative aperture and focal length.

An ingenious camera of very small size has recently been made by Messrs. Krauss, although it cannot be said that the makers have been very happily inspired in the form which they have given to it, namely, that of a small automatic pistol. Nor in the name, which is the "Photo-Revolver." I should be inclined to fear retaliation by some passer-by whose photograph I might have obtained with the camera. However, the little appartus is fitted with an *f* 4.5 Krauss "Tessar" in focusing mount, and carries 48 plates of 22 × 36 mm. size, equivalent to about ⅞ × 1⅜ inches. These plates are obtained by cutting into six those supplied for the Verascope and similar stereoscopic cameras. The four-speed ever-set shutter is controlled indirectly by a trigger. On push-

ing the trigger the lens front is moved to the rear; this front is fitted with four rods (very accurately calibrated), which are caused to bear on the emulsion surface of the plate (not on the metal sheath which holds the plate). It is only after this contact has been made, with consequent assurance that the plate is in the position of the sharp image, that the shutter is released. Springs fixed round each of the rods bring the lens front back to its normal position as soon as the picture has been taken and when the trigger has been let go. The changing box, which forms the handle of the revolver, is made in two adjacent divisions, each operated by a blind which conveys a plate from one division to the other and *vice versa*.—L. P. Clerc in *The British Journal of Photography*.

Mounting Gelatine Filters

Many photographers using color filters for ortho or panchromatic plates for reasons of economy use the gelatine film slipped between the components of the lens. This plan is in every way satisfactory, the only argument against it being that the gelatine surface of such filters is very delicate and easily spoilt through over much handling. It is a good plan when purchasing these filters to mount them for use between two circular-shaped rings of thin cardboard of exactly the diameter of the lens. This will enable the filter to be handled without the fingers actually coming into contact with the gelatine film, and will further assist in removing the filter from the lens. Care must be taken that the inner circles of the mounts are no smaller than the largest stop fitted to the lens, or exposure calculations will be seriously upset. If there is a difficulty in slipping the mounted filter out of the lens a couple of tiny tabs of black velvet may be attached to the edge of the cardboard mount. These will allow more easy handling if the lens mount is too deep or narrow to allow the insertion of the fingers, and if the filter mount is a tight fit (which it should be in order to keep it central and avoid interference with the stop) a pair of small tweezers may be employed to grip the tabs and lift the filter out. The above plan is of real value in keeping the gelatine filter in good condition, and the trouble is well worth while in saving the cost of the constant renewal of spoilt filters, due to the accidental touching of the gelatine surface.—*British Journal of Photography*.

New Books

American Annual of Photography for 1922. Edited by Percy Y. Howe. Paper covers, $1.75; cloth, $2.50. Geo. Murphy, Inc., New York.

The *Annual*, despite the difficulties attending the printing industry, is quite an improvement upon its predecessors. The contributions are excellent and upon a variety of subjects pertinent to the needs of the photographer who practices in the different provinces of the art. It is well illustrated with the worrk of both amateur and professional photographers.

The British Journal Photographic Almanac for 1922. Paper covers, $1.00; cloth, $1.50. Geo. Murphy, Inc., American Agents, New York.

This annual of photography is awaited with interest by both professional and amateur as the valuable epitome of progress in the art, inasmuch as its contents invariably record what is essential to advance and of pertinent importance. While the interest in photography is greater than it has been in the two previous years of peace, no particular novel discovery can be chronicled, but much has been done in perfecting and improving methods of work, particularly in the facility of development in white light and in widening the scope of cinematography in color. The practical tone of the *British Journal' Almanac* is refreshing as this annual has become the *vade mecum* of the photographer who looks to it on the best source of reliable facts for production of the highest grade work.

The editor has kept this feature in contemplation and has succeeded in giving a trustworthy reference book which has taken in consideration every possible inquiry the student wants information of.

Pictorial Landscape Photography. By the Photo-Pictorialists of Buffalo. Issued through American Photographic Publication Company, Boston, Mass. Price $3.50 net.

The society known as the Photo-Pictorialists of Buffalo was born, according to their historian—whoever he is—about 1907, and died, according to the preface, in 1914. The object of the book is to record and preserve their activities. This is very praiseworthy; and it will afford a useful addition

to the history of the period—and it was a very interesting period—in which the organization flourished.

Its advent resulted, in all probability, consciously or unconsciously, from the photographic reformation, inaugurated by the Photo-Secession; for the work of its members was like some of that of the Secession. We do not recall, however, that the Buffalo group was ever recognized by the Secession, individually or collectively.

The historian has performed his task quite well; but what he has written would have created a much better impression if he had not been, in some instances, so cocksure and insistent upon the certainty of his own knowledge and statements.

The chapter on "Pictorial Landscape Photography—its Nature and Scope" will be read with interest, and will be found instructive for the novice and delinquent veteran. Likewise, this might be said of "Some Notes on Equipment," "On Field Tactics" and "The Negative and Its Enlargement." The chapter which will arouse the greatest opposition, and to which the most exception will be taken, is "Modification of the Negative," in which the historian advocates sundry interferences with the negative, enlargement, etc., admitted to be non-photographic.

In this chapter he mentions Steichen, and, we think, rather flippantly. For the benefit of the newcomer we will say that Steichen was declared by Rodin to be the greatest photographer in the world; that he was the one man chosen by our Government when we entered the war as capable of heading the nation's photographic section of its air service and, upon his arrival in France, was made chairman of the Inter-Allied photographic contingents. It may interest our Buffalo historian if we add a little history and inform him and others—on the subject of modification—that Col. Steichen, who worked every photographic process, and indulged in all kinds of manipulation, was so impressed by the wonderful results achieved by straight photography during his unusual experiences in the war, and by its possibilities, in his judgment as an artist, for pictorial purposes, that since his return he has destroyed some of his old, manipulated negatives, disposed of some of his equipment, and has joined the ranks of those whom our historian, on page 44, characterizes, contemptuously and conceitedly, as "the straight print cranks."

The chapter on "Carbon and Other Processes," and that on "Carbon Printing," ought to be received with approval, and to be of much service to many that favor various methods of working for serious results, or even as a source of enjoyment. The carbon process is too much neglected in this country; and we agree with the historian that, all in all, there is none that surpasses it for pictorial results, in skilful hands.

There are treated also "Presentation of the Print," "The Advantages of Small Groups of Workers," "Multiple Gum Printing," and "Gum Bromide," by others than the historian.

Finally, we come to the reproductions. "By their fruits shall ye know them." Do these show that non-photographic manipulation, practiced and advocated, has enabled the Buffalo group to produce pictures so superior that all the world should run after them? Let everyone answer for one's self. In our judgment, if the best that they can do with it is seen in the illustrations, all their trouble and pains have gone for naught. There are some very beautiful and enjoyable motives to be found among others that are only ordinary, and a couple poor in selection and arrangement. Dealing with the former, their excellence is to be found in the soft, vague, flat tones and mystery, which contribute so materially to the poetry and romanticism inherent in some of them. These features are always beautiful in art by any medium. But all this can be done, and is being done, by suitable soft-focus lenses, properly used, without deviating from the straight and narrow path of unmanipulated photography.

If one were to criticise the work of this group as a whole, fine in some respects as it is, one would find, we think, too much sameness in the low key. A "group" nearly always makes for monotony. The examples are "seven-eighths black, one-eighth white, all mournful," as was said by some one of somebody else about ten years before our group came into existence. A few such motives look well among brighter themes, but it would be a dismal photographic world if everybody made pictures that way and lived with them. Even where they were intended to be bright they are dark sometimes. A picture called "Night" by one member looks as much like another's entitled "Sunshine" as two peas in a pod. "Evening" resembles "A Summer Day." The reproductions may be somewhat at fault.

During the seven years since the passing of this group more luminosity and sunshine have been introduced. These Buffalonians have a right, however, to their way and their say, and no one should deny this to them. At the same time, everyone else should be accorded the same right, which the historian seems sometimes to deny them. At any rate, no one is so big or important that he is privileged to rule and decide with omniscience and infallibility in photographic matters, or to class those who differ with him, as "cranks."

The volume is finely produced—excellently bound, well printed on good paper, in clear type.

Joint Display at the Camera Club

The exhibition at the The Camera Club, New York, during January comprised a joint display of photographs by William Elbert Macnaughton and William A. Alcock, president and vice-president, respectively, of the Photographic Department of the Brooklyn Institute of Arts and Sciences.

There were twenty-seven examples of the work of the former and about thirty of the latter.

The principal characteristics of Mr. Macnaughton's pictures were quality, delicacy in romantic landscapes, evenness of size, mounting and, with three exceptions, uniformity of process. Those of Mr. Alcock were more forceful, varied in dimensions, process and subject. The former's works were, as a whole, more restful; the latter's better viewed separately. Hence, every one of the numerous visitors found something to admire and satisfy, according to their tastes.

Among Mr. Macnaughton's best were: "The Brook," "Top of the Hill," "Near Harrisburg," "Summer Evening," "Connecticut River," "Solitude," "Near Great Barrington," "Westchester Landscape," "Sunlight and Shadow," "Peconic Bay," "Berkshire Hills," "Old Stone Bridge" and "Scallop Boats." A rendering of "A Head" was novel and very pleasing.

Mr. Alcock's most attractive were: "Poor Old Pell," "Bill," "Minna Jagels," "The Curtain Rises," "A Lonely Vigil," "April Flurries," "Arch of Jewels," "In the Fog," "Whirlpool," "Rapids" and "Miss Laura Lee."—Floyd Vail, F. R. P. S.

Furfural in Corncobs

Experiments conducted by chemists of the Department of Agriculture show that the much-despised corncob has been found to contain not only the ingredients for the manufacture of high-grade binder paste, but ten per cent of furfural, one of the basic needs of the chemical industry in the manufacture of the whole range of coal-tar products from dyestuffs to photographic material.

The furfural, which was extracted by the analysts from the residue left after the paste had been developed, will be of vast assistance to the rapidly growing American dye industry if it can be produced in commercial quantities.

Light Action on Color of Flowers

Light particularly acts on vegetable colors and in a manner varying with each color. Nearly every ray of the spectrum can act. Thus the rays from the green, as far as the violet, bleach the yellow stain of the crocus when paper is impregnated with it.

In the same way the red and yellow rays change the rose-red color of the stock; the rich blue of the sweet violet, which carbonate of soda makes green, is bleached by the same group of spectrum rays.

Experiments show that every part of the spectrum is active in effecting change, and that certain vegetable colors are influenced more by certain rays than others.

The leaves of the Papaver Rhaeas flower decolorize more rapidly under a blue than under a clear piece of glass.

According to Herschell, the colors of flowers bleach most rapidly in colors complementary to them, thus the coloring matter of yellow flowers fades under blue light, that of violet under green, blue under yellow, purple under yellow and green.

Neol

This developer, introduced by the firm which discovered the now world famous metol, has been much advertised lately in the Continental journals, and broad claims are made for it. This is not unusual in the introduction of new coal-tar products, and time and experience will be required to ascertain the real value. A contribution in the case is made by C. Barreca, Eng. D., in *Il Corriere Fotografico,* from which the following data are taken.

Neol occurs in light gray and minutely crystalline needles, with a silky luster. It is insoluble in cold water, freely soluble in hot water and in alcohol. If caustic alkali or carbonate is added to the boiling solution, a white precipitate falls, which is soluble in excess of the reagent. The solution treated with a few drops of ferric chloride gives a violet liquid and a brown precipitate, results that indicate a derivative of salicylic acid. The makers state that the material is "paraminosalicylic hydrochloride," and thus is analogous to the amidol group of developers. Barreca made analyses of the commercial article, and confirms the general statement of com-

position. He gives a good deal on the structural formulas, which information is not of importance to the general mass of photographers. He studied its adaptability to development upon a variety of exposures; internal views, open air with sunlight, under-exposed instantaneous, and portraits. He used a solution containing in 100 c.c., 5 grams of dry sodium sulphite, 1 gram of neol and a small amount of sodium hydroxide (caustic soda). He found that it is satisfactory for a variety of purposes, yielding well modulated negatives, and giving good detail. In fact, it appears that the tendency to a delicacy in the image is such that care must be taken in making prints or the finer details will be lost. He states that for this reason he does not submit any prints for reproduction, as they would surely lose their characteristics in the process of photo-engraving. The tendency to high detail may make the developer of advantage in photomicrography. The most important claim made for neol is that it corrects even serious over-exposure, such, for instance, as may occur when taking an interior with windows facing the camera. The plate can be developed so as to get detail in the shadows while the windows will not be clogged up. The author's opinion is that the substance represents a material advance in the production of a good, all around developer. It is hardly likely that a firm so famous as Hauff would put out an inferior article, but on the other hand, early claims are often found not fully sustained, and we must await a more extended study.

Sensitiveness of Minerals

The boundary line is faint separating inorganic from organic living matter, according to M. Mahondean in an article in *Revue de L'Ecole d Photographic*.

According to this investigation, there may be here, as in all natural things, a total absence of precise demarcation as well as reciprocal pentration of the two modalities of matter, one mineral, the other organic. If this be granted, it is not at all surprising that identical phenomena should be produced in substances which are supposed to be inanimate, as well as in those recognized as sentiment, and there is no reason for viewing with distrust the surprising experiments which prove the existence of spontaneous and sensitive manifestations in what we now regard as dead matter.

We are hardly prepared to admit such a thing as consciousness or even mechanical life in most elemental forms, metals, for instance, but the writer contends that the metals possess, to a certain degree, faint but positive sensibility and possibility of movement corresponding to what is called sensibility.

Metals get fatigued and show that they are tired. Numerous examples are quoted which show that the tired metal recovers when given rest, as the animal does by sleep.

Lord Kelvin observed that metal wires submitted to repeated vibrations, work quite differently from those not treated. Repeated movements seem to weaken the power of metals but rest cures them, showing plainly that they can be overworked.

Entry blanks are now ready for the Montreal A. A. A. Camera Club's Sixteenth Annual Exhibition, which opens in Montreal, Canada, April 3rd to 8th, inclusive. Blanks and full particulars may be obtained from the Secretary, 250 Peel Street, Montreal, Canada.

The first meeting this year of the Pictorial Photographers of America was held at the Art Center, 65-67 East 56th Street, New York City, on Monday evening, January 9. Mr. Elbert Macnaughton presided. The spacious hall was crowded to the doors. Mr. Ira W. Martin gave us a very excellent talk upon Still Life. His remarks were replete with wisdom and truths in re-composition. Mr. Martin was followed by Mr. Richard M. Coit, of the Brooklyn Institute, whose dissertation upon Landscapes was truly elegant, pleasing and instructive; his many references to the term "landscape adjustor" was a great source of joy and entertainment; it is safe to say that Mr. Coit has coined a compound etymological entity which always will be photographically with us. There was a large entry of prints illustrative of the subjects of the evening. Mrs. Hervy and the rest of the hanging committee are to be highly complimented upon their indefatigable energy in making this part of our meetings a great success.—T. W. Kilmer.

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SELECTION AND USE OF ILLUMINANTS FOR STUDIOS—LEON GASTER, F.J.I.

IT IS my intention, in this introductory paper, to indicate a few problems that deserve fuller study in connection with the use of artificial light in studios. Some of these were discussed at a recent meeting of the Illuminating Engineering Society devoted to "The Use and Abuse of Light in Studios for Kinema Film Production," and the Society is now forming a committee, on which the Royal Photographic Society has been invited to be represented, in order to study the subject in greater detail.

The problems that arise in the use of artificial light in portrait studios are broadly similar to those met with in kinema studios, but in the latter case the intensity of illumination is much greater in view of the shorter exposure. In ordinary photographic studios exposure by artificial light is very commonly undertaken. Arc lights and gas-filled incandescent lamps may be used for this purpose. In kinema studios mercury vapor lamps and special "spot-lights" which resemble electric arc-searchlights are also used. The comparative advantages of these various illuminants require fuller study. Dr. Kenneth Mees has discussed these qualities in detail, and others in the United States have prepared tables of relative actinic power. Similar figures have been presented in Germany. In this country it would appear that a full systematic and authoritative study of the various illuminants has not yet been published, and the evidence from tests so far made is somewhat conflicting. Data should be available showing *(a)* the comparative photographic effect for a given illumination (*i.e.* photographic effect per foot-candle), and *(b)* the comparative photographic effect for a given consumption of electric energy (*i.e.* photographic effect per watt.)

I should like to make it clear, however, that the exact meaning to be

attached to "photographic effect" or "photographic efficiency" needs very careful definition. I notice that Dr. Bloch took as his unit the photographic effect (on silver chloride and bromide emulsion) of the Hefner lamp at a distance of one metre. Others have adopted a scale based on the photographic power of sunlight, taken as 100.

The photographic effect is usually judged by experimenters by observation of the density of the image produced on a photographic plate with a given exposure. The method of comparison adopted by Jones, Hodgson, and Huse in the United States for various illuminants was somewhat elaborate and resembled the procedure in ascertaining the speed of photographic plates. A "sensitometer," involving a falling diaphragm with a series of slots of different width, so as to vary exposure, was used. From observation of the exposed plate a diagram connecting logarithms of exposure and density of image was prepared, and the inertia (reciprocal of sensitiveness) of the plate with each illuminant noted.

By this method the authors were able to prepare tables of photographic efficiency, but it was freely acknowledged that the numbers presented could not be regarded as settling the comparative value of the illuminants, without due consideration of other circumstances. In particular most investigators have been careful to point out that such relative values would depend on the type of plate, film, or sensitized paper used. Results for an ordinary and a panchromatic plate, for example, are admittedly quite different. For published data on photographic efficiency, see *Lichttechnik,* by L. Bloch, p. 579, and a paper by Jones, Hodgson, and Huse in *Trans. Ill. Eng. Soc. U. S. A.*, vol. x, Dec. 30, 1915, pp. 980-981.

This question of defining photographic or actinic power of artificial illuminants is a fundamental one, on which the concerted efforts of photographic and lighting experts are needed. In any case data will need very careful interpretation. This has been well illustrated by Dr. Kenneth Mees, who remarks that almost all sources of light have an application in some branch of photography. Each source has its own particular sphere of application and no one source is suitable for all purposes. Claims are sometimes made on behalf of some lamp as an ideal source for all purposes, but such claims only do harm to the cause which they are intended to advance. It is better to recognize that photography is a wide field, having many subdivisions, and that nearly all sources of light can be applied with advantage in some one or other of those divisions.

Before an opinion can be given regarding the relative efficiency of illuminants in various fields of photography we need to understand which part of the spectrum of the light yielded is useful for the purpose in view. As is well known, the sensitiveness throughout the visible and ultra-violet spectrum varies greatly for different photographic materials; for this reason "actinometer" readings, involving observation of the time during which sensitized paper reaches a given degree of darkening, may give rise to different results from those attained by "sensitometer" methods alluded to above, when applied to artificial illuminants possessing different spectrum composition.

W. A. BARTZ

W. A. BARTZ

In particular some difference of opinion seems to exist in regard to the value of the ultra-violet region of the spectrum in studio work. It has been argued that this part of the spectrum is of great value as the sensitiveness of many plates and films has its maximum on the boundary between violet and ultra-violet. Others, however, think that the ultra-violet rays might be suppressed without material detriment to exposure, seeing that the ultra-violet rays are largely absorbed by the air and the camera lens. This is surely a point that deserves to be settled, especially in view of the fact that some ophthalmologists consider that an excess of these ultra-violet rays may, unless proper precautions are taken, have a prejudicial effect on the eyes. It would be helpful, therefore, if one could feel sure that such rays could be absorbed by a special screen, allowing visible rays to pass, without any material drawback from the photographic standpoint.

There is also the further consideration that rays at the other end of the spectrum—*i.e.*, in the orange and red, have relatively little photographic effect. Possibly, therefore, these rays might also be excluded, thereby reducing the glare from visible light. I understand that in some forms of studio lighting units using gas-filled lamps, the light is reflected from a lilac-tinted surface whereby the impression of brightness on the eyes of the subject is much diminished, but the photographic effect is scarcely affected.

All these considerations, however, are based on the assumption that we are dealing with a plate or film having the maximum sensitiveness in the violet or ultra-violet, and with a very small sensitiveness to the red and orange. If we could design a plate or film with quite a different distribution of sensitiveness the whole problem would be altered. The great majority of artificial illuminants have their maximum of radiation in the infra-red—*i.e.*, beyond the visible red, and give the maximum luminosity in the visible yellow. Might it not, therefore, be possible to prepare films or plates, especially for kinema work, where high sensitiveness is so important, with a distribution of sensitiveness approaching more nearly the distribution of visual brightness in the spectra of artificial illuminants—*i.e.*, to obtain a maximum sensitiveness, if not in the yellow at least in the visible region, so that photographic and visual effect more nearly correspond? In other words, to adapt our film to the illuminant as we cannot adapt the illuminant to the film? Any success in this direction might have very important results. It would mean that the impression of brightness received by the eye was a much better indication of the effect that would be produced photographically, and it would enable various sources, such as the gas-filled lamp, to be used in many fields of photographic work for which they are not at present very suitable.

Another problem of great interest, alike to lighting experts and to photographers, is the judgment of exposure. It is admitted that ordinary actinometer readings have their limitations in judging exposure by daylight, since they take account of the light striking the instrument, but do not necessarily indicate the amount of light reaching distant objects, nor do they take into account the proportion of light which objects reflect. When we are dealing with the varied

spectra of artificial illuminants, the actinometer readings become still less useful as a guide. To lighting experts, accustomed to base all their plans on actual measurements of visible illumination, it seems strange that photographers have made so little use of photometry. In a factory, as a matter of course, our first step is to ascertain the intensity of illumination in foot-candles with a portable photometer and consider whether this suffices for the object in view. Very little data are available, however, regarding the intensity of illumination that should be provided in a photographic or kinema studio; comparisons between different lamps are rarely made on a basis of the actual illumination provided on the object photographed. Admitting that these photometric measurements determine visible light, and not photographic effect, it still seems probable that they might be of considerable value in photography. They would, for example, give satisfactory *relative* values—*i.e.*, they would determine the numerical ratio between the light falling on different parts of a scene, and enable a producer to ascertain when any part of it is under-lighted and will not appear satisfactorily in the film.

Some producers, I understand, correct the effect of brightness by viewing the scene through colored glasses so selected that the apparent brightness thus seen is a fair criterion of photographic effect on the film. Presumably, however, this method would not be accurate for different illuminants, and possibly the most scientific method would be to have available a series of factors for the chief illuminants, relating photographic effect to illuminating power, by the aid of which readings with an illumination photometer could be corrected. By this means one could say that for a certain illuminant a certain illumination in foot-candles was necessary to obtain correct exposure; by using a photometer, which enables the actual brightness of distant objects to be determined, one could even go further and take into account the amount of light reflected from the subject illuminated.

I would like to suggest, therefore, that in photometry we have a process that might be of considerable use to photography, and that we have here a problèm where the joint efforts of expert photographers and lighting specialists might be exerted.

Assuming that one has arrived at certain values for the intensity of illumination necessary for various illuminants, the next point that arises is the manner in which the light should be diffused and distributed. This point is of interest in view of the reports of injury to the eyes of kinema actors being caused by exposure to very powerful lights at close range. This particular aspect of kinema studio lighting has been the subject of inquiry by a committee under the Ministry of Health. Owing to the short exposure and the consequent high illumination needed, the matter seems likely to be more important in kinema studios than in studios devoted to portrait work. But even in the latter case the concentration of a very brilliant light near the face of the subject has drawbacks, for example, in rendering it difficult for the face to assume a natural expression. Some of the lighting units devised for portrait work utilize only reflected light from a concave matt white surface (or a lilac tinted surface as

mentioned previously), and apparently these are used with good results. I would like to ask whether, in the opinion of those present, no naked source should ever be visible to the eyes of persons being photographed in a portrait studio. I have heard it stated that the soft shadows resulting from such diffused methods of lighting give rise to a much more pleasing effect than the "hard" light of a small, unshaded concentrated source.

If it be agreed that unshaded powerful sources of light are undesirable in portrait studios, the next question that arises is whether a similar rule can be recommended in kinema studios. Some experts have informed me that the use of powerful naked lights is not necessary in kinema studios, and that it is undesirable on account of the hard black and white contrasts produced. Others consider that in certain cases the use of unscreened lights cannot be avoided, or that the habitual screening of all illuminants would mean unduly great consumption of electric energy.

This question is one that our Joint Committee will have to determine. In view of the fact that expenditure on lighting is usually but a small fraction of the total expense of producing a film, it would seem desirable to employ diffused methods of lighting if technical considerations are in favor of this course. In the event of its being recognized that in certain cases unscreened lights are inevitable, it might be possible to specify a minimum distance between such lights and the actor, or to suggest means of lighting such that the lights do not fall within their direct range of vision. These, gentlemen, are some of the problems awaiting the consideration of our Joint Committee, and their solution demands the co-operation of lighting experts, photographers and opthalmologists, besides the assistance of representatives of the kinema industry, and we are hopeful that, by promoting joint action between these various experts, useful results will be attained.—*The Photographic Journal.*

IODIZED ENGRAVINGS ON PAPER

THE reproduction or exact copy of a steel engraving upon paper and also upon copper may be obtained without the use of light. Every dot, every line, both figures and letters may all be produced in a very perfect manner, particularly upon paper that has been specially treated to receive the impression, while the impression may be transferred to metal and developed by mercury and by a somewhat circuitous process become etched. For simplicity of producing an exact copy of an engraving without the aid of light or lens, depending upon chemical action only, the process to be here described is of extreme simplicity.

The process is based upon the property of greasy ink, such as is used by printers, lithographers and plate printers, to absorb iodine, which it does even after the print has been made many years, while the paper, although porous, does not absorb this element when exposed to its influence for the space of a few minutes at ordinary temperature, usually from three to five minutes is sufficient. The temperature will affect the time of exposure to the iodine vapor.

During hot weather a minute or two will prove sufficient with a comparatively new engraving.

Should the engraving be a small one—and it is with such that it is advisable to practice in the beginning—an ordinary plate box, 4 x 5, may be used to contain the crystals of iodine by first inserting a clean glass plate, then fitting a strip of wood at each end, about an eighth of an inch in thickness and cut so that they will fit the box by being pressed in, so that they will jam slightly against the sides, or they may be held in position with a touch of hot sealing wax, but they must be so fitted that a depth of an eighth of an inch is allowed from the top sides of the box, to permit of the small engraving resting at the ends, allowing about half an inch space between the iodine and engraving.

The box should be kept away from the influence of damp previous to introducing the iodine, because the moisture that would ascend with the iodine vapor would charge the paper of the engraving as well as the ink, which would spoil the result. The image would then present a blurred appearance, due to the liberation of absorbed iodine from the plain parts of the print, and thus be spoiled.

If the right time is hit in the exposure to the iodine vapor a brilliant and sharp impression will be made upon the piece of damped starch paper in blue iodide of starch. Now, if this piece of paper with its image in blue be pressed lightly into contact with a clean and polished copper plate, in the course of a short time an image will be formed upon the copper plate corresponding with the blue lines of the iodide of starch, an image being formed in iodide of copper.

If the plate be silvered like the Daguerreotype plate, and the same process repeated and the plate be exposed to the vapor of mercury at the temperature of 120 degrees Fahrenheit, a perfect Daguerreotype will be the result after being fixed and treated as in the Daguerreotype process, which may, in turn, be etched and made into a printing plate.

The etching was originally carried out by submitting the Daguerrotype to the action of hydrochloric acid, which attacked a portion of the plate, the white silvered portion, formed by the action of light, leaving it slightly in relief, and the plate was then submitted to an oily prepared ink, so as to fill in the faintly etched portion, the plate being carefully wiped so as to leave the silvered parts exposed. The plate was then placed into a cold solution of cyanide of gold and a deposit of gold made upon these exposed parts. This being accomplished, the inked part was wiped and cleaned when the plate was etched with weak nitric acid, the raised portions being coated with gold were not affected by the acid, and thus the necessary relief was obtained. No doubt perchloride of iron would answer the purpose better, being employed in the same way as it is today in the process of photo-engraving. The above was the plan and process of M. Donne and Fizeau. Some time after this an improved method by M. Poitevin was shown to give a decided advantage for the production of a printing plate from a Daguerreotype, which can be obtained from an engraving by the process described with iodide of starch.

The plate must be developed with mercury vapor as described, then in place

HOWARD HALL AS "LINCOLN" NED VAN BUREN

"DUDLEY" NED VAN BUREN

of fixing it in hyposulphite of soda it must be dipped directly after development into an electrotyping bath, when it will be found that the copper will adhere only to those parts that have been acted upon by the mercury, while the unacted-upon iodide of silver will not receive a deposit. The plate must now be washed and placed into a solution of hyposulphite of soda, which will clear out all the unacted-upon iodide and leave the plate bare. The plate may now be heated to cause the freshly deposited copper to oxidize. It must then be covered with mercury, which will attack the silvered surface only.

The plate is now coated with gold leaf and heated to drive off the mercury, after which it is etched in the usual way, by weak nitric acid, the edges being protected by inking and resining with dragon's blood.

The gold-amalgamated parts of the plate remain untouched by the etching fluid, while the exposed copper portions become eaten away, which then will give a plate suited for printing in the press.

The whole process requires skill and patience, nevertheless a printing plate can be made by this means without the aid of a camera, lens or negative.

METHODS OF LIGHT DISTRIBUTION IN PHOTOGRAPHIC STUDIOS—JOHN W. T. WALSH, M.A. M.S.C. AND H. H. BUCKLEY, B.S.C.

(From the National Physical Laboratory.)

THE authors wish to make it clear at the outset that this paper does not deal with any problem involving a technical knowledge of the principles of photography. All that it is proposed to do it to describe briefly the resources which are at the disposal of the photographer when designing his studio-lighting, and the methods which are commonly adopted for the measurement and control of the performances of such sources and fittings as may be selected.

It may not be altogether out of place first to describe briefly the units employed in photometry for the measurement of candle-power and illumination, and the manner in which these two units are connected.

The candle-power of any luminous source in a given direction is measured by the illumination which produces at a surface placed at a given distance from it, and perpendicular to the incident light. The illumination produced by the source to be measured is compared with that produced by a standard electric lamp placed at a definite fixed distance from the surface. This standard lamp is of known candle-power, and since the illumination produced by a lamp of candle-power K at a distance d from a surface is proportional to K/d^2, it is clear that the candle-powers of two lamps are in the ratio of the squares of their distances from a surface at which they produce equal illuminations. The photometer is an instrument for bringing images of the two sides of a white screen, each illuminated by one of the two lamps to be compared, into juxta-

position so that equality of brightness may be obtained by altering the relative distances of the lamps from the screen.

If d be expressed in feet, the illumination is K/d^2 foot-candles, and thus we have the relation between the candle-power of a lamp in a given direction, and the illumination it produces at a surface placed at a given distance from it. The unit of illumination, the foot-candle is thus the illumination produced by a source of 1 candle-power at a plane surface which is distant 1 foot from the source, and which is perpendicular to the incident light. If the surface be inclined so that the angle which it normally makes with the incident light be θ, then the illumination is reduced in the ratio of cos θ to 1.

There are two more technical photometric terms which need to be defined. These are "brightness" and "reflection ratio." The illumination of a surface does not in any way depend on the nature of the surface, but only on its position in relation to the sources of light and on the candle-power of the latter. The illuminations of a piece of black velvet, and a piece of white blotting paper lying side by side on a uniformly lighted table are equal, but their brightnesses are very different owing to their different capacities for reflecting the light which they receive. The "reflection ratio" (often called the coefficient of reflection) of a surface is, as the name implies, the ratio of the light reflected by a surface to that which it receives. The reflection ratios of some typical surfaces are given in the following table:—

TABLE I.—*Reflection Ratios.*

Surface.	Approximate Reflection Ratio.
White blotting paper	82 per cent.
Human face ... ... (average)	30 "
Yellow brick wall	35 "
Grass	20 "

The brightness of a surface is, then, proportional to the product of the reflection ratio of that surface and its illumination. For a large number of surfaces such as those enumerated in Table I the reflection does not vary greatly with the direction of the light reaching it, but polished surfaces reflect very strongly in the direction of specular reflection, and if light be reflected in this manner from certain parts of an object, those parts will appear as bright spots in a picture and may produce a most disagreeable result. This effect can be avoided when polished surfaces are being worked with, by suitably diffusing the light or arranging that the direct component cannot be specularly reflected from the object to the camera. This question of brightness is one of paramount importance to the photographer. The maximum contrast usually obtained on a photographic paper is of the order of 30 to 1—*i. e.,* about the ratio of brightness found with black print on white matt paper. Hence, if the picture is to have the appearance of a true representation, the lighting should be so arranged that the brightnesses of the objects do not vary by very much more than this amount.

This means that excessive shadow must be avoided. On the other hand,

too complete a diffusion of the light, with consequent loss of shadow, gives to objects an unnaturally flat appearance. It has been pointed out by Luckiesh and others that a landscape appears most pleasing to the eye at morning and evening, when the shadows are cast by a low sun. It seems probable that the same consideration holds in studio lighting, and that a well-pronounced directive component, at an angle of about 45 degrees or less with the horizontal, is desirable in addition to a well-diffused general illumination. This is obtained, in daylight, with ordinary lateral lighting supplemented either by a half-roof light or else by an inclined white screen on the wall opposite the window.

In artificial lighting a semi-indirect fitting, in which a large part of the light is thrown on to the ceiling, provides a good form of diffused lighting. The light transmitted through the bowl sometimes provides a sufficiently strong directive component, but often it is found necessary to place a direct lighting fitting near by to add sufficient directed light.

It is now proposed to deal briefly with the relative intensities of daylight and different forms of artificial light. In photometric work the light-giving powers of sources are expressed in terms of the candle, and illuminations in foot-candles, and these units will be used in what follows. A convenient standard to remember is that the illumination of a horizontal surface in the open at noon on a bright day in summer is, on the average, about 5000 foot-candles when direct sunlight is excluded. On a bright day in December the illumination has only about one-fifth of this value. The illumination on the face of a sitter facing a window in a well-lighted room is of the order of 10 per cent. of the outside illumination measured on a horizontal plane. It may be pointed out, in passing, that for studio purposes the illumination on a vertical plane is generally far more important than the illumination on a horizontal plane. The ratio of the indoor to outdoor illumination is usually termed the "daylight factor," or the "window efficiency." Unless otherwise specified these terms refer to illuminations on a horizontal plane, but there is no difficulty in obtaining similar figures for vertical planes.

A number of different kinds of illuminants are used for the artificial illumination of studios. Among the most common are gas-filled tungsten filament lamps, incandescent gas mantles, mercury vapor lamps and electric arcs. The

TABLE II.

Source.	Relative Efficiency.		
	Ordinary plate.	Orthochromatic plate.	Panchromatic plate.
Sunlight..............	100	100	100
Mercury vapor lamp...	316	354	273
Carbon arc............	126	112	104
Tungsten vacuum lamp.	35	43	51
Gas-filled lamp........	60	65	73

actinic values of these several illuminants vary considerably, as is shown in Table II, which gives the relative actinic effects of equal illuminations (measured visually) for these sources of light.

The figures in the above table (taken from a paper by Jones, Hodgson, and Huse to the American Illum. Eng. Society.) indicate the relative values of equal illuminations (measured visually) due to different sources in the case of the three types of plates.

At the same time it cannot be assumed that objects illuminated by the mercury vapor lamp will give three times the effect on the plate as those illuminated to the same degree (measured visually) by an electric arc, for the effect on the plate is the result of actinic *brightness* of the object, not its illumination *per se,* and as the reflection ratio of most surfaces varies with the wave-length of the light they receive, it follows that an object which reflects only red light may appear actually brighter (photographically) than a blue object when both are illuminated by light very rich in red rays.

When designing the artificial lighting of a studio the following methods are available:—

(1) Totally indirect lighting, in which all the light is cast on to the ceiling and upper parts of the walls by means of an opaque reflector placed under the lamp. This system gives the most fully diffused light. For small rooms lighted by a single unit, with the ceiling in a good state of whiteness, it may be taken that a 100-watt gas-filled lamp will give an illumination in the centre of the room (underneath the fitting) of about 3 foot-candles on the horizontal plane, or 2 foot-candles on a vertical plane. The latter figure is more dependent than the former on the amount of light reflected from the walls, and a dark decoration may give values rather lower than that mentioned.

"AN AUTUMN GALE" F. J. MORTIMER, F.R.P.S.

MISS FOSS NED VAN BUREN

LEAH BAIRD NED VAN BUREN

(2) Semi-indirect lighting, in which a portion of the light from the source is transmitted directly to objects under the source through a translucent glass bowl. In this system the same power will give approximately 30 to 50 per cent. more light than an indirect system. The value obtained is not so dependent on the decoration of the walls and ceiling. The light is less completely diffused and there is an appreciable amount of shadow due to the light component received directly from the bowl. The latter, therefore, should not be directly over the object to be illuminated.

(3) Direct lighting, in which the light is cast directly by the source on to the object. Shadows are strong unless a number of sources, well distributed over the room, be employed. Side lighting and top lighting may often be combined with advantage, and the figure of illumination actually obtained in any particular case will depend very greatly on the distribution of the sources. In general it may be assumed that a direct fitting giving approximately the same distribution of light as an indirect fitting will give about twice as much light on a horizontal plane underneath it, for the same size of lamp. If reflectors be

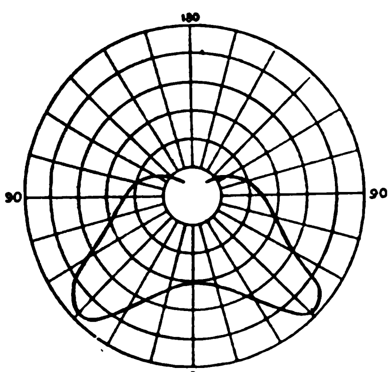


FIG. 1

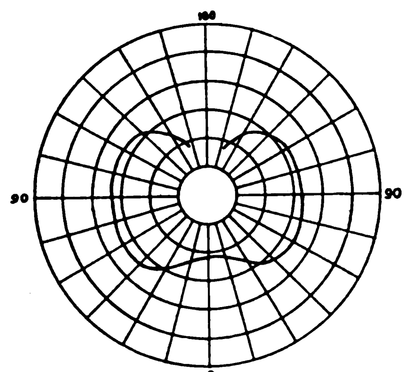


FIG. 2

used above the lamps, the distribution of the light will be profoundly modified by these. In cases of direct lighting fittings it is usual for polar curves to be given showing the distribution of light from these fittings. The use of these curves is best explained by means of an example. Fig. 1 shows the polar curve of light distribution in a vertical plane from a gas-filled lamp placed in a holophane reflector. The lengths of the radii vectores are proportional to the candle-powers of the fitting in the different directions. The illumination at any surface, due to the light from this fitting, may be readily calculated from this curve, by finding from the curve the candle-power in the direction of the surface, dividing by the square of the distance of the surface from the lamp, and multiplying by the cosine of the angle of incidence of the light. If there be more than one source, of course, the separate effects of each must be added together to obtain the final result. The effect of the reflections from walls and ceiling is not at all easy to calculate. It is not always appreciated that the candle-power of a light source alone is not by any means equal in all directions.

Fig. 2 shows the polar curve of light distribution from the plain lamp (without reflector) used in the fitting of Fig. 1, and it will be seen from this that the candle-power in the downward direction is very much less than that given in the horizontal direction.

It seems scarcely necessary to mention that lighting from the front is much softer than lighting from behind, and that the main components of the light should, therefore, be from sources in front of, to the side of, and above the object to be lighted.

In spite of the necessarily very sketchy character of this brief description of the photometric methods generally employed for the measurement of light sources and illumination, the authors hope that they have been able to show that the photometrist can help the photographer principally in two directions, viz.,

(i) The measurement of candle-power of sources of light and of the manner in which the light from the source is distributed by any form of fitting; and

(ii) The measurement of the illumination produced at a given point by a given system of lighting units, and of the reflection ratios of different surfaces ordinarily met with in photography.

The spectrophotometric measurement of the transmission ratios of colored filters is another important field in which the photometer must be employed to aid the camera, but it has not been touched upon this evening as not falling properly within the subject indicated by the title of this paper.

"SUMMER" F. J. MORTIMER, F.R.P.S.

FURTHER NOTES ON AMIDOL

FRENCH photographers employ this developer very much, as is evident from the frequent allusions to it in their journals. Some of these articles have been abstracted in recent issues of THE PHOTOGRAPHIC JOURNAL OF AMERICA. A lengthy article, signed L. J. B., in the latest issue of *Photo-Revue*, shows good results with lactic acid as a preservative of the developer. Amidol requires no alkali, but its solution does not keep well, and solutions such as metol-hydroquinone or metol-glycin are more convenient for those who make pictures now and then. The formulas given by the French author are somewhat unsatisfactory, because they recommend some substances by the sp. gr. of their solutions without giving the actual strength. The lactic is given as of 1.21 sp. gr. This is the strength used by druggists, and such a solution can be obtained from a drug or chemical supply-house. It contains about 85 per cent of true acid. The bisulphite solution is probably that furnished by the Lumière's. The following formula is advised:

Water	1 quart	1000 c. c.
Amidol	75 grains	5 grams
Dry sodium sulphite	625 grains	40 grams
Lactic acid (sp. gr. 1.21)	1 dram	5 c. c.

The author emphasizes the necessity for the chemicals to be of good quality. The amidol should be in needles, dry and with very little discoloration. The sulphite should be from freshly opened packages. The solution rapidly develops plates normally exposed, and, contrary to general opinion, it furnishes, with good brands of plates, negatives that suffice for all kinds of printing. It may be advisable to add a few drops of potassium bromide solution, which will give excellent blacks well adapted for sulphur toning.

The peculiarity of amidol is that it develops in acid solution. French photographers generally call it diamidophenol. It is really the hydrochloride, and it seems hardly worth while to use the long technical name, when most of the other organic developers are generally known by the brief trade names. A special formula is given for cases in which the exposure is uncertain, or in which the object is such as to require very careful treatment. This is as follow:

Water	3 fl. oz.	100 c. c.
Amidol	11 grains	0.75 gram
Dry sodium sulphite	60 grains	4.0 grams
Sodium bisulphite solution	1 dram	6.0 c. c.
Potassium bromide	1.5 grains	0.1 gram

The bisulphite solution is the commercial form of specific gravity 1.28 (32° B.). The amount given in the formula is an average; for over-exposures, or where there are strong contrasts, a somewhat larger amount may be added, but in general that given will suffice.

This developer is suitable for orthochromatic plates without screen, which are growing in favor, but with these the full effect of the color range is

not obtained unless the development is pushed into the depths of the film. It is also the best developer for panchromatic plates in which a tendency to fogging is manifested with the common developers, especially when such plates are not quite fresh. This developer also has a good temperature range, acting at nearly 80° F. without fogging or loosening the gelatin. Diluted with four times its volume of water it gives good results in tanks; the duration of action should be about 20 minutes at about 60° F. The plates thus obtained are noticeable for the purity of the shadows and the transparency of the high-lights.

The acid amidol solution has also a unique property in that it may be converted into a very powerful developer by the addition of from 3 to 5 per cent of acetone, quite remarkable in cases of under-exposure. When a plate develops very slowly, large spaces remaining unchanged and the operator despairs of getting anything satisfactory, the addition of acetone will start up an action so promptly as to astonish one. The resistant portions are brought out in a few seconds, and a good picture is obtained from a plate that seemed hopeless. This addition of acetone must, however, not be made until the original bath has evidently exhausted its action. It is advisable to use a plate that has been desensitized with sasfranin to avoid the fog from the light that may be somewhat actinic.

This acid amidol bath is also suitable for chloro-bromide papers. The following composition is recommended:

Water	3 fl. oz.	100 c. c.
Amidol	13 grains	0.75 gram
Dry sodium sulphite..............	60 grains	4.0 grams
Sodium bisulphite sol.............	1 fl. dram	4.0 c. c.
Lactic acid.......................	20 drops	0.5 c. c.
Potassium bromide sol............	60 drops	1.5 c. c.

This has the advantage of restraining the excessive rapidity of development, which, with many baths in use for such papers, is one of the inconveniences, but it does not in any way injure the purity of the whites or the perfection of the blacks. It is the only bath suitable for temperatures of about 77° F., which temperatures are frequently reached and passed in the summer season. Many manufacturers state that their formulas are efficient between the temperatures of 60° and 70° F., but it would be more satisfactory to the ordinary worker if some advice was given as to methods of procedure outside of these limits.

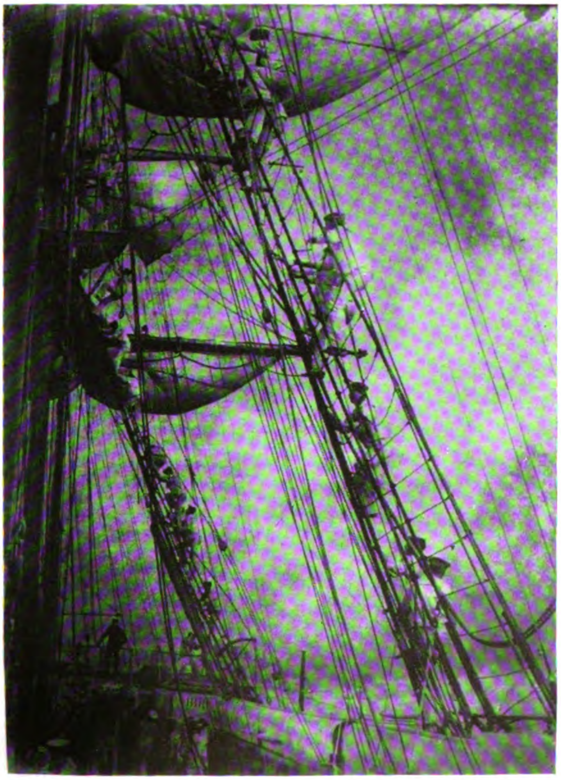
Amidol is applicable to the development of positives sensitized with chloride or chloro-bromide. The annexed formula gives cold sepia tones not always easily obtainable by other methods:

Water	1 quart	1000 c. c.
Amidol	75 grains	5 grains
Dry sodium sulphite..............	250 grains	16 grams
Ammonium bromide..............	150 grains	10 grams
Potassium meta-bisulphite.........	1 oz.	28 grams
Lactic acid.......................	1 fl. dr.	5 c. c.

Just before using this bath add to each 100 c. c. (3 fl. oz.) 4 c. c. (somewhat less than a fl. dr.) of acetone.

Amidol is satisfactory in the fixing-developing solution, when combined with acetone. (This procedure was briefly described in THE PHOTOGRAPHIC JOURNAL OF AMERICA, for September of 1921.) In all cases the acetone must be added only when the solution is to be used, as it interferes with the preservative action of the lactic acid.

The result of these investigations is that amidol is found to be a developer of wide range of applicability, the principal objection heretofore to its use, its poor keeping qualities in solution, has been eliminated by the use of lactic acid. It is necessary to insist upon the importance of the use of good materials, especially good sulphite. In the formulas given the proportion of sulphite has been purposely placed somewhat high to allow for the fact that the commercial samples are often decidedly below strength in real sulphite. In conditions in which sulphite is very liable to deterioration, it is advisable to have recourse to potassium metabisulphite, which keeps well, but in such case the acidity of the substance must be neutralized by some alkali. Dry sodium carbonate is suitable; it will neutralize double its weight of the metabisulphite, but has the disadvantage of emitting bubbles of carbon dioxide which may collect on the



"AWAY ALOFT" F. J. MORTIMER, F.R.P.S.

plate. Borax is free from this objection; employed in the proportion of about 6 parts by weight of the commercial article to 3.5 parts of the metabisulphite, good results are obtained. The modified formulas are as follows:

NEUTRAL BATH

Water	1	quart	1000	c. c.
Amidol	80	grains	5	grams.
Potassium metabisulphite	380	grains	25	grams
Borax	660	grains	43	grams
Lactic acid	1	fl. dr.	5	c. c.

ACID BATH

Water	1	quart	1000	c. c.
Amidol	112	grains	7.5	grams
Potassium metabisulphite	1.5	oz.	40.0	grams
Lactic acid	1.0	fl. dr.	5	c. c.
Potassium bromide	16.0	grains	1.0	gram

OXIDATION OF AUTOCHROMS

ALL color photographs in which the tri-color screen is permanently fixed to the plate, as in the autochrom, require the first development to be removed, in order to give a correct representation of the object. Generally the plate is redeveloped from the silver bromide, which has been unaffected in the original exposure, but in some cases a satisfactory picture can be obtained by simply allowing this bromide to remain unchanged. The destruction of the original silver image is usually carried out by immersing the plate in a mixture of potassium permanganate and sulphuric acid, which is the method always recommended by the manufacturers of autochroms. In their first publications they did not give specific warning as to the inadvisability of keeping the permanganate and acid in mixture, but later directions provide for two solutions to be mixed as wanted. Strongly acid solutions of permanganate are apt to deposit manganese oxides, which will produce stains. The strength recommended for autochroms is about 32 grains of permanganate and one-third of a fluid ounce of sulphuric acid to a quart, that is, 2 grams of the salt and 10 c. c. of acid to a liter. Under ordinary circumstances, when potassium permanganate in the presence of sulphuric acid acts as an oxidizing agent, potassium sulphate, manganous sulphate and oxygen are produced The oxygen is not, however, set free, but oxidizes the silver, and the silver oxide is dissolved by a portion of the acid. Enough acid must, therefore, be present to take care of all the metals. The formula given by Lumière has a great excess of acid over all requirements, which is no objection. About one-fourth of the oxygen in potassium permanganate is available for oxidizing purposes, and, therefore, the solution given above will furnish about half a gram (7.5 grains) of oxygen, enough to oxidize over 13 times its weight of silver.

Out of the many other oxidizing substances known to the chemist, few are suitable for this work. Farmer's solution would probably be satisfactory, if

it did not also dissolve the unchanged bromide. One solution, however, has some distinct advantages which make it worth while to mention it. This is a solution of potassium dichromate (commonly called bichromate) and sulphuric acid. These substances can be kept mixed in strong solution indefinitely and constitute a powerful oxidizing agent. The reactions are similar to those with permanganate, resulting in the formation of potassium sulphate, chromic sulphate and silver sulphate. The yield of available oxygen is not so great in proportion as with permanganate, but is easily compensated by a slightly stronger solution. Three grams of the dichromate and 5 c. c. of the acid will give about equivalent action to the usual autochrom formula. These quantities are approximately 46 grains of dichromate and one-sixth of a fluid ounce of acid, but it is much more convenient to make up a much stronger solution and dilute it as required. Double the above quantities may be dissolved in half the amount of water, that is about 100 grains of the dichromate and one-third of a fluid ounce to a pint of water. This solution diluted for use with three times its volume of water will give an efficient oxidizer. The mixture gives off no fumes, but is quite corrosive, so care should be taken in handling it. A fluid ounce of the strong solution will suffice for several ordinary plates. No stains are produced, and the pale red solution allows the action to be watched more satisfactorily than with the deep red permanganate. After oxidation is complete, the plate should be washed for a short time, and it will be an advantage if it is immersed for a few minutes in a weak sulphite solution. The potassium and chromic sulphates formed in the reaction constitute chrome alum and may have a hardening effect upon the gelatine, which is not unacceptable in this case, the film of the autochrom being rather tender.

Ammonium persulphate has not been found satisfactory for this work, and nitric acid is efficient only in rather strong condition, in which it gives off objectionable fumes.

THE DANGERS OF THE ARTISTIC PHASE

IN any process of development, organic or social, there is always a tendency to exclusive differentiation in some one particular direction of least resistance, which results in a high phase of specialization not always the best for the healthy growth of the organic whole.

The conviction which confronted the professional photographer, when the artistic amateur opened his eyes to the æsthetic possibilities of photography, naturally deflected his energy most exclusively to the improvement of the profession in this specific direction, and it was not long before a most marked advancement was noticeable in professional portraiture. This art phase was truly most essential, and one cannot over-estimate its continued importance. It has so leavened photography as to be essential to its growth and well-being, but it cannot be denied that photographic art is practically at a standstill.

It might be argued that all art essentially is sensational, since its object is to work upon our feelings, but sensationalism, as generally regarded, is consid-

ered as a sort of adventitious growth upon art, and therefore abnormal, springing from a superfluity of vigor, and rather contributory to the debility and decay of art than to its healthful progress.

As, in the animal organism, health is the outcome of harmony among the parts, and disease the result of the increase of the activity of any special function over others, so, in art, any too-great tendency in a specific direction, either in ornamentation or penchant for novelty, is sure indication of a morbid condition, which, if suffered to progress unchecked, may lead to the debasement of art itself.

Sensationalism, briefly defined, is a misapplication of vigor, attracting by its singularity rather than by its beauty of expression. It refuses to take the proper channel by which art alone is effective, preferring to create new paths for itself, dissipating its energy over new and untried fields until it is either absorbed by the unsuitable soil, transformed into obscuring mists and fogs, or becomes stagnant pools of miasmatic influence.

Photographic art, plainly speaking, is becoming sensational. It it suffering with æsthetic plethora—and a little critical cautery might do it good. The affected adulation only ministers to its disease.

The idea is too prevalent that an artisan is a mere craftsman, while the "artist" is one born with the divine æsthetic afflatus, which high prerogative entitles him to consider technique of minor importance.

But the study of the lives of those eminent men of the past whose work continues to delight with its perennial freshness, beauty and originality, reveals to us the fact that they began life as handicraftsmen, and developed by a natural process of growth into artists. An ironworker developed into a Peter Vischer, a goldsmith into a Cellini, a wood engraver into a Dürer.

Such men as these thought it not derogatory to their genius to make any kind of work, but they put their soul into their work.

It looks like a false move to separate art and handicraft, to elevate what is considered "art" alone. Art and handicraft must go yoked together, but in the earlier plowing the strain should be upon the yokefellow—Handicraft.

Art truly is an inspiration, but it vibrates only to those movements of the intellect which have been keyed to its responses—by the cunning hand of earnest, zealous work.

While we exalt art, let us not forget that its head of gold depends for its exalted position upon its legs of iron and its feet of clay.

The whole trouble is this: The artistic profession has been coddled up with the notion that art is belittled by exalting handicraft.

Though sensationalism springs from vigor, it possesses not the strength of simplicity, which confers enduring interest. It is exaggerated vigor—as sophistry was defined by Plato to be that which, not being philosophy, aimed at seeming to be such. So, sensational photography pretends to the vigor which is beyond the ability of the artist. Vigor which cannot obtain its purpose by the powerful way of simplicity, seeks to reach it by inferior roads, which for a time are certainly better traveled and more popular.

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Slow-Burning Film

The problem of obtaining a satisfactory film free from the inflammability of the ordinary nitro-cellulose has received a great deal of attention in recent years, especially on account of extensive use in motion picture projection. The ordinary film not only burns very fiercely, but to a certain extent maintains its own combustion, and hence motion picture installations have to be provided with complicated safety apparatus. This is not so serious in fixed installations, for the construction of a booth under the official regulations is not expensive and its operation is not inconvenient, but the occasional use of the motion picture, as in schools and ordinary halls entails considerable trouble and expense.

The most promising substitute for the standard film is an acetyl cellulose, which is very slow burning, but not incombustible. The main danger in accidents in the ordinary halls is panic. The fire itself is not usually the cause of loss of life, but the effort of the audience to escape often leads to many injuries, and fatalities. A movement for the prohibition of the nitrocellulose film was started shortly before the World War in France, and it is stated on good authority, that had it not been for the disturbance brought about by the war, a law on the subject would have been enacted. Recently, the Pathé firm applied to French authorities for such a prohibition, although apparatus has recently been exhibited in France which, it is claimed, permits any film to be held motionless for a considerable time with a light from a high amperage current.

At a recent meeting of the French Photographic Society, a communication was read by M. Clement on the value of acetyl cellulose film. The following abstract is taken from the Bulletin of the Society. After some account of the methods of manufacturing films, with notice of the numerous precautions required to secure a clear, tough, flexible product, specific data in regard to the acetyl product are given. It was about 1906, that this product became industrially important. Chemically it is cellulose acetate, and is made by the action of acetic anhydride upon cellulose (cotton fiber or paper stock). The process is complicated. The product is a white powder soluble in acetone to a viscous liquid. As noted above, the material whether in powder or film is difficult to ignite, burns slowly, curling up markedly during combustion. Obviously the applicability of such a film to motion picture work at once aroused interest. Its low inflammability caused its extensive use in airplane construction. More careful study, however, was needed before its value as a complete substitute for the nitrocellulose could be established. The principal objections made by motion picture producers were lack of high transparency, brittleness and general want of durability. Comparative investigations are reported in the communication under consideration such as, resistance to rupture; elongation before rupture; resistance to folding, determined by repeated folding along a given line; trial of a film in a projecting machine until a break occurs. This last test was made by running an endless band of 2 meters (about 7 feet) of the film continuously through the machine. The most difficult part of this test is to make the cementing of the two ends of the film. If the film is short the cemented junction will pass through the machine with undue frequency. It is fair to leave out of consideration all breaks at, or very near, the junction, but even with all precautions, the test is comparative not absolute. Other tests are: measurement of change of length after maintaining the film for several days at about 140° F. This gives an idea of the behavior of the film in use, it being assumed that several days at the above point will be equivalent to several weeks at ordinary temperatures. Measurement of the expansion in water, which serves to determine the effects of the several baths to which the film will be subjected after the picture is taken. Measuring the shrinkage after drying, a test that will also determine the amount, if any,

of curling during the drying. Determining the strength of junctions. In making such junctions the following solution is applied:

Acetone	100 grams
Dichlorhydrin	100 grams
Cellulose acetate	2 grams

The points to be joined should be rasped somewhat. The same solution can be used with the ordinary nitro-film.

A table is given showing in detail the results of the tests. The conclusions are as follows:

The film tested was a little more elastic but not so strong as a nitro-film also tried, and is also a little more brittle. The acetyl film shows less shrinkage with the heat test. This last effect is probably due to the fact that the so-called plastifiants which are added to the acetyl product are less volatile than those used for the common film. No specific difference was noted in the behavior of the two kinds of film in the photographic baths.

The conclusions are that the slow-burning film is sensibly similar to the ordinary product, but this is not true of all the slow burning films offered for sale. Some samples have proved to be distinctly unsatisfactory. It is suggested, therefore, that some standard tests, such as those enumerated be applied by film makers, so as to keep the product up to its best condition. Slow burning film is more expensive than the common form, but when the convenience and question of lessened danger are considered, this one drawback should not be allowed to influence the choice. The introduction of a good slow-burning film will be a most important step towards popularizing the motion picture for real educational purposes, which is one of the great desiderata at the present time. Should a really satisfactory slow burning film be obtainable, official action should be taken in all civilized countries to compel its exclusive use.

Fixing Prints

We often wonder whether the printer imagines that he perfectly fixes his prints by the method he pursues.

Perhaps he does not think at all on the subject, but he ought to know that perfect fixing is essential to permanency.

The object of fixing as we have been repeatedly told is to remove from the film or paper all the silver haloid not acted upon by the light as well as the derivatives.

In a well fixed print the ground of the picture should remain white when exposed to light or action of gases in the atmosphere; that is, there should be nothing in the high-lights but pure white paper, and no action should be anticipated beyond the mere mellowing which age produces on paper.

We are inclined to think that most photographic prints nowadays on silver are not permanent because the very method of evolution precludes permanency. They cannot be properly fixed when made according to modes of manipulation generally pursued.

This is presumably the case with prints made on most of our modern printing out papers—especially when toned and fixed in the same bath (combined bath).

First, on account of the vehicle holding the silver salt, and, second, on account of the compounding solutions to which the exposed image is subjected.

Emulsion papers, collodion or gelatine, when used with combined baths, should not react acid. If they so react they ought to have a preliminary good washing before toning and fixing.

The combined bath, when acid, causes sulphurization.

The constitution of a combined bath is hypo or sulpho cyanide of potassium, gold and alum. From the interaction sulphurous acid is let loose and taken up by the bath solution. This sulphurous acid is an active reducer of gold, and a good percentage of it is thrown down in the bath before the prints are subjected to it so that our prints get very little of it.

The object of good toning, even in the daguerreotype days, was to add to the permanency of the photograph.

Undoubtedly it does if we allow it to deposit on the image; but if little or none is disseminated through the solution, how can we expect the print's preservation, or how can we expect to utilize the gold for giving a good color?

The tones are wholly or partially sulphur tones, especially when a salt of lead is added to the toning bath.

The sulphide of lead makes our print turn yellow.

Not only are emulsion paper prints imperfectly toned and fixed, but even plain paper prints.

Plain paper prints furnish some very beautiful tones, and much may be said in regard to their superior keeping qualities over other prints; but the printer, in mak-

ing them, entails upon them a predestination to short existence.

We have seen artistic plain paper prints as woebegone-looking in a short time as any aristo print.

To make a beautiful plain print, which shall last for years in all its loveliness, it ought to be fixed in pure plain hypo (1 to 8), and we should not try to get any other color than the reds, sepias and browns with gold toning. If we desire black tone, use platinum. The bath employed for plain paper prints ought to be much diluted, so that the toning proceeds slowly.

Too many prints should not be fixed in the same bath. Hypo is cheap. If any of the double salts of hypo sulphite of soda and silver are allowed to remain, streaks and spots will eventually make their appearance.

Thorough washing, but not over-prolonged deluging with water, is necessary.

A print can be washed too much, as well as too little.

The hypo bath should not be used freshly made, but should be allowed to stand some time before putting in the prints.

First, because fresh hypo solution is ice cold, and cold retards chemical action; and second, because there is a liability of undissolved particles to float around in the bath which serve as nuclei for deposits in the paper.

All this has been said and said again, but our observation has proved to us that it needs to be said once more.

Aerial Photography

The value of the airplane as a means of map making was amply demonstrated during the war. While ingenious camouflaging often prevented the scouts from getting accurate details of the area, the conditions in peace are much more favorable. The application of photography to surveying is not new, but the earlier experiments were, of course, carried out upon the surface, by methods described in some detail by several workers, among which may be noted Floyd D. Garlock, U. S. A. In his book, figures are given of several forms of apparatus, such as the photo-theodolite. These were the products of the Zeiss works at Jena. The earliest applications of the methods seem to be due to Laussedat, who began in 1849, making drawings by the aid of camera lucida, but shortly afterwards substituted photographic procedures. He gave a full exposition of his methods, and for some time no appreciable advance was made upon them. Workers in other lands took up the investigations, and in Canada, in the eighties of the last century, the official surveys employed them, an account of the work being given by E. Deville, Surveyor General of Dominion Lands. The general methods and results will be found detailed in Deville's book and in that of Garlock, noted above.

The perfection of the airplane and dirigible, with possibilities of wide range of area and elevation, has given a much greater opportunity for map-making and steps are now being taken to utilize these methods. An Associated Press dispatch gives information as to the Army Balloon and Airship School now being opened at Ross Field, Arcadia, Cal. The plotting study room is equipped with a large photographic map, covering about 250 square miles of that region, this being a mosaic of several thousand photographs taking from an altitude of about 500 feet. It is stated that a number of cities are planning to have such a series of maps made as guides in planning, traffic control, street widening, fire protection and many other problems which are of great importance in municipal affairs.

It is, however, probable that a still more important application of airplane photography will be found in the mapping of districts practically inaccessible, or difficult of access by reason of hostile tribes and dangerous animals. Desert and swamp areas can be accurately mapped without danger or trouble. The airplane is not so satisfactory for such work as the dirigible, which can be held stationary more easily, but methods of taking overlapping pictures are being perfected which enables the maps to be taken in sections from a rapidly moving plane. Necessarily, numerous mechanical improvements in lenses, cameras and other portions of photographic apparatus must be made before the work can become entirely satisfactory, and the questions of elevation and angle of view will have to be carefully considered. The methods, however, are rapid and no important feature of the landscape is likely to be overlooked.

It does not seem likely that these methods will do away with the standard methods of surveying with transit, theodolite, plan-table and level, but they will supplement them. It seems, for instance, improbable that the determination of contours, which is such an important feature

of the recent maps, especially the topographic maps of the United States Coast and Geodetic Survey can be made with anything but standard instruments, but there is no limit to human ingenuity apparently, and even this problem may be placed within the scope of aerial photography. The general methods of taking pictures from airplane have been elaborately set forth in a recent work by Herbert E. Ives. Views so taken are now familiar in newspaper and magazine illustration. The use of such views for advertising an estate was noted in THE PHOTOGRAPHIC JOURNAL OF AMERICA for May, 1921.

Thought Images

The phenomena of vision has only an indirect bearing on photography. The analogy of the eye to the camera in the mathematical, mechanical performance in projection of the image of things may be very close, but the individual reports to consciousness are by no means identical; the mind acts the part of a transformer and the mental conception is as different from the actuality as the real tapestry face pattern is from the seemingly designless mingling of colored threads on the back.

Impressions upon the complicated nerve fibres of the retina are first received. A picture is as certainly there formed as is one upon the ground-glass. This impression endures for an appreciable time, but in what terms is it conveyed to the brain?

Physiologists, by experiments upon the lower animals, have demonstrated that there are certain definite areas of the cerebral substance which respond to nervous action stimulated by vision and recently Henscher furnished proof from pathological observation on man, that there is a projection upon the brain of the retinal image.

It has been known, for quite a while, that many animals, chameleons and especially a certain fish, adapt the color and even the pattern of their skin to the appearance of their surrounding.

Ponchet showed that this ability for adaptation ceases as soon as their eyes are removed—that is, when the retinal image is not present to provoke it. M. Sumner reports where the fish actually reproduced the pattern design of the bottom of the vessel they were in.

So much for the physical side of the subject. We know this much on the metaphysical, that there is high probability that impressions once made, may, independent of physical action, be revived, (redeveloped as we say photographically), by the nervous stimulus produced by some corporeal disturbance in much of the original vividness so as to deceive the observer into a belief of actuality.

This phenomenon may be referred for explanation to the category memory pictures, but the explanation is not forthcoming withal.

It would be hard indeed to determine whether the brain had power of making phonographic records which the will switches on through memory, or does the will, imagination, or what not, actually, as in the case of the fish, project an impression upon the retina which is thus conveyed to the brain?

It is not unreasonable to conclude, since the retina is really a part of the cerebral apparatus in direct communication with what we properly call the brain, that thought images may be able to give rise to perception much in the same manner as images projected on the retina by optical means.

Sky Wonders

The famous photographs of the sky, particularly of the milky way, made by Prof. E. E. Barnard, of the Yerkes Observatory, have revealed many wonderful features. One of these is the frequent occurrence of stars of nearly equal brightness in straight or curved lines extending over a considerable space. In a paper on "Star Streams" Prof Barnard expressed the belief that these are not simply fortuitous, but that the arrangement in this striking manner is due to some definite physical connection between the stars involved.

These curves, or "festoons," usually occur on parts of the sky where the stars are uniformly scattered on a dark ground, and one is struck with the presence of a great many lines of small stars and of narrow dark or vacant lanes, usually of uniform width.

If on a sandy space there has been a gentle wide overflow of water, which has carried the sand with it without digging out a channel, when the water has subsided, its flow can be detected by the appearance of the sand particles alone. In quite as real a way Prof. Barnard believes that his photographs reveal great drifts of the stars through space.

Practical Aerial Photography

America has added another important invention to her rapidly increasing number of distinctive achievements in aviation. It is the perfected aerial camera which has just given a remarkable demonstration of efficiency in a photograph of New York City from the air. Municipal engineers say it will save many thousands of dollars and years of engineering work in effecting public improvements. The photograph is more than 8 feet long and 20 inches wide. It shows more than 32 square miles of the metropolis, every street, building, vehicle and person out of doors, just as one would see it looking down straight upon it from a position high overhead.

The machine which made the photograph possible is a big camera, with several new devices invented by Sherman M. Fairchild, President of the Fairchild Aerial Camera Corporation, 136 West Fifty-second Street, New York. His experiments during the last three years have been directed toward making the camera accurate and economical, the main essentials in practical commercial photography, particulaly aerial maps, such as that of New York.

Inaccuracy has been the chief difficulty with various kinds of apparatus employed heretofore. Many technical problems were overcome by the Fairchild inventions, which so improved the mechanism and actual work of this new camera, that the results were better than 99 per cent. accurate—more than sufficient for all practical purposes, according to municipal officials and engineers and those of large corporations who see in this development limitless possibilities for saving time and money in many branches of their work.

The New York photograph is a vertical one; that is, it was taken from an airplane flying directly overhead, and is known technically as a mosaic or aerial map. Using a film similar to the ordinary camera, though larger, and regulating its exposure by means of an electric timing device, gauged to the relative speed of the airplane from which the camera was operated, Fairchild succeeded in removing the hundred and one difficulties which have delayed commercial progress in this kind of mapping.

Plotting the city into rectangular sections of a scale so that each section could be photographed individually from the plane right over its exact center, the entire city from the Battery to Van Cortlandt Park was divided into 100 parts. Each of them was photographed. The hundred photographs were taken in a single flight of 69 minutes. As the plane passed over the center of each rectangular section, there was an automatic click of the camera, and the film automatically rolled into position for another exposure a few seconds later. When the sections had all been "snapped," Fairchild had 100 photographs, all together totalling an area of approximately 32 square miles. They were then fitted together like a picture puzzle and mounted on cardboard—and there lay New York, with everything out of doors plainly visible and accurate in size and location.

The Battery, Madison Square, Fifth Avenue, Central Park, the office buildings, motor cars, roofs of factories, mansions and tenements, smoke-belching chimneys and the oil-flecked waterfront, with the various centers of population and dense traffic portrayed in true porportions and convincingly—all at a glance, all this and more developed in one picture. When it was shown to city officials, they were amazed.

"Why, this seems to be the only method by which we can secure first-hand information about the city; and it is the quickest and most inexpensive thing I ever heard of," said a city engineer.

At New York Police Headquarters, Inspector Davis said: "If I had had an aerial survey of my precinct, I could have sat at my desk and determined the location and details of every roof exit, scuttle hole and skylight, had all that information right in front of me. It would have been a great help to us in directing a raid or surrounding a burglar."

Commissioner Joseph Johnson, of the Department of Public Works, said he had intended motoring out to inspect two proposed operations, but that with the map on his desk, he could attend to it there in a few moments. Nelson P. Lewis, of the Russell Sage Foundation, and noted city planner, believes that in the future the aerial map will be used in all city planning operations, as it will enable them to plot the most direct routes, locate obstacles, determine the number of overheads and short cuts, and lead traffic up through the city and out into the suburbs. He said:

"A relief map in the study of any territory looking to its best development would be of the greatest value, but that could be made only after the collection of accurate information and as the result of field surveys. If then, without equipping survey parties and spending weeks and months laboriously collecting information, which is later to be used in these relief maps and models, we can, in as many days, obtain accurate information from an aerial photograph, or mosaic, it is quite evident that a great advance has been made in planning for the future development, not only of cities, but also of suburban and rural districts." At the office of the Borough President, it is planned to use the aerial camera to determine, through calculating distances by interval exposures, just how

far groups of traffic can proceed for a given period of time with the least interference.

The possibilities and practical value of aerial maps and photographs are limitless, say experts, who point out that since they first came into use during the World War, thousands of ways have been discovered for making them distinctly important—and relatively inexpensive—in all commercial and industrial fields.

Like many notable inventions, applied photography from the air is accredited to accident. It appears that a private soldier, in the early days of the war, secured a ride in a battle-plane flying over the front. Against the rules, he took along his little camera and snapped whatever he saw below that interested him. On landing, his films were confiscated by officers, who, to their astonishment, found that the negatives provided them with accurate and detailed information, which even the trained eyes of the observers had missed. It was a permanent record, that set of photographs, could be studied and interpreted by many eyes, many minds, quickly, hastily, or at leisure, whenever opportunity arose or occasion demanded. One would see an important detail; another would learn something that effected his plan and therefore of immediate and urgent importance to him, thus originated aerial photography. Continued expansion of the idea has resulted in cameras being made that will take detailed photographs from an altitude of 35,000 feet, though for special commercial work, such as the New York map, 10,000 feet is considered most economical. But 5,000 feet altitude is most efficient for portraying everything below more clearly than one might see it with the naked eye. Aerial photographs, taken from an angle, are termed oblique views and often are effective from the pictorial viewpoint. To the person studying the oblique photograph it is the same as occupying a grandstand seat in the sky, with the panorama laid out before him and receding in the distance.

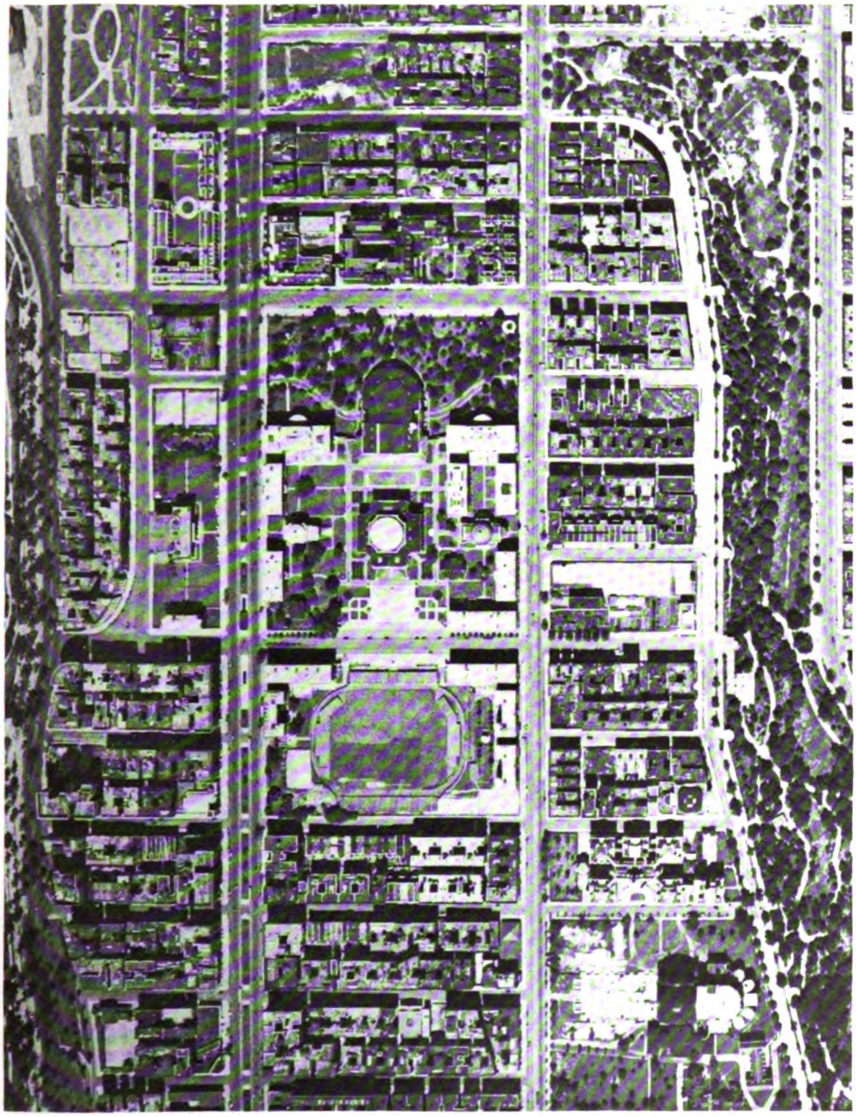
The aerial map, or mosaic, or vertical view, as it is variously known, is a different thing. It requires an equality of detail throughout and over large areas, while the oblique loses the detail in the background. The details diminish with great rapidity and, due to the angle at which the picture is taken, will not permit of overlapping or joining consecutive areas.

On the other hand, the angles of the vertical picture are symmetrical and permit the overlapping of a large number of photographs, thereby covering great areas and maintaining equality in detail. That is the mosaic, or aerial map for which the Fairchild camera is peculiarly adapted. It secures accuracy over unlimited areas.

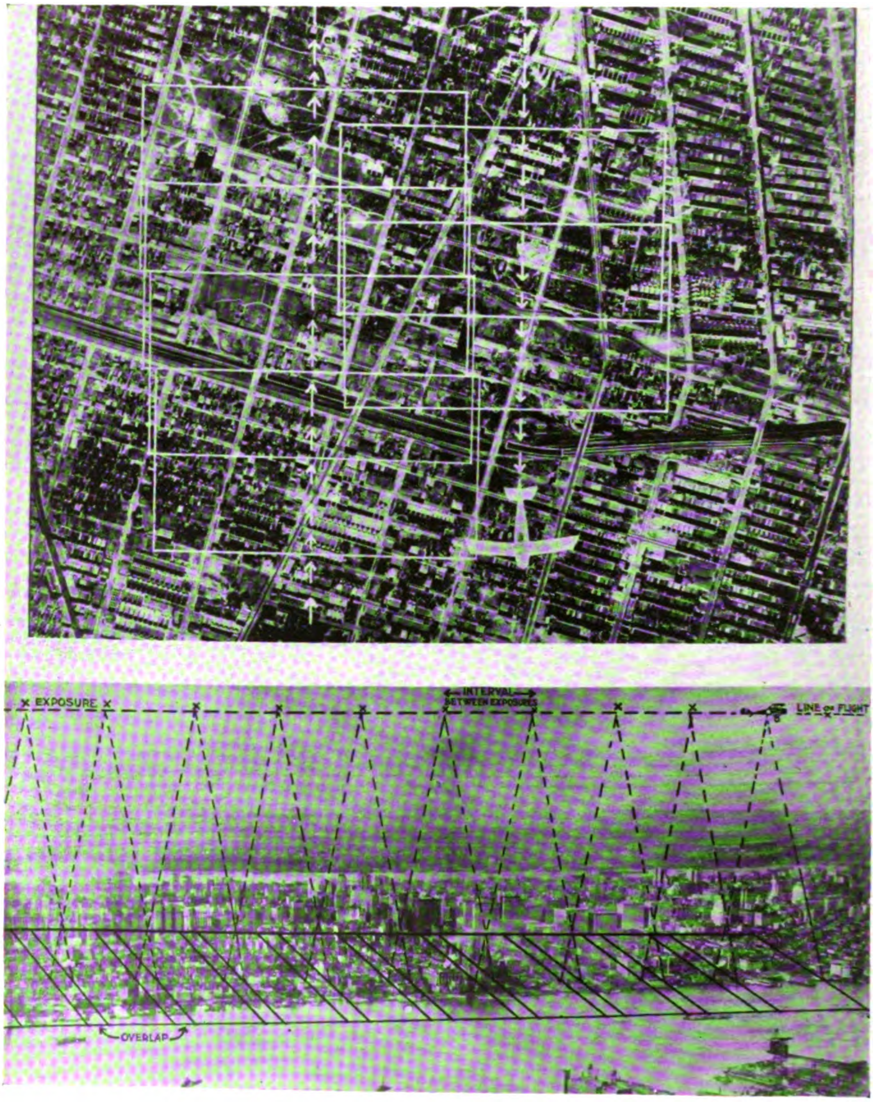
To secure this accuracy, Fairchild developed what is known as a between-the-lens shutter, which actually saves the brief instant which other shutters spend traversing the plate during the exposure. This instant would matter little in ordinary photography, but in mapping, or making vertical shots, the speed of the airplane would cause a distortion in the map. The focal-plane shutter has been used in the past and serves its purpose for oblique views which do not require accuracy. The between-the-lens shutter exposes the entire plate in 1-150th second and it can be seen that the plane has traveled no distance in that instant. The whole plate is exposed at once, instantly, and from the same position, while the focal plane shutter, though its speed may be rated 1-150th second, actually exposes part of the plate only in this time. That part or portion exposed is only the actual width of the slit in the shutter curtain; but this distance must be multiplied by the actual length of the plate —and in reality the time taken for the exposure is reduced to approximately 1-10 second, during which time the plane has traveled approximately 16 feet. All of which is to say that the picture is taken from two viewpoints 16 feet apart at its ends. This causes distortion, which makes accurate joining of pictures extremely difficult and often times impossible.

The new camera is equipped with the automatic interval device for timing exposures according to the speed of the airplane and the automatic spacing device for conserving the film, or in other words, getting more exposures on one roll of film. These also are recent Fairchild inventions which make the true vertical photograph possible. With the perfection of his gyrostabilizer, which permits the airplane to swing at an angle while the camera remains stationery and insensible to the vibration of wind and motor, the inventor feels confident that photographs can be taken in the absolute vertical, thereby affording a base line from which all other angles may be computed. The vibration of the motor and the wind puffs from the propeller, as it whirs at terrific speed, sending some 2400 wind puffs back every minute when the plane is making 90 miles an hour, are serious handicaps to a camera which is not balanced correctly and safeguarded from these disturbances.

Actual uses to which the new Fairchild camera has already been put would seem to illustrate the soundness and practicability of the inventor's conclusions. Take the aerial photographs of the Carpentier-Dempsey fight in Jersey City for example. Fairchild photographers, experimenting with the camera, remained at an altitude of 2,000 feet, thereby obeying the law. The weather was anything but propitious for photography. It rained at intervals, mist



A Section of the New York Mosaic Map. It is the Morningside Heights District. The white circle in the center is the Dome of the Columbia Library. Just below may be seen the South Field. In the lower right-hand corner may be seen the Cathedral of St. John the Divine. Note the seven chapels at the right and at the left, the foundation of the uncompleted Cathedral. Along the right side of the picture may be seen the Morningside Park, and in the extreme upper corner Grant's Tomb. This view is one of the one hundred vertical photographs that go to make a complete Mosaic of Manhattan Island. The view is a permanent record made by one flash of the shutter.



A diagram, showing how thirty-two square miles of New York was plotted and photographed in sixty-nine minutes with a Modern Aerial Mapping Camera. Above is a plan of the area. Below is a cross-section diagram, showing the method of procedure.

shrouded the earth and blotted out all details to the human eye. But the eye of the camera nearly a half mile up there over the great arena caught the complete details, despite the law regarding low flying over the crowd, the rain, weak light, haze and heavy mist.

The aerial photographers operating the Fairchild camera photographed the preliminaries of the championship fight, took them back to Manhattan in their flying boat, landed, hurried into a newspaper office, where the films were developed and the prints were actually mailed to all newspapers throughout the country before the bout had been decided. After delivering the negatives, the camera men again flew back over the arena in Jersey City and snapped the big fight from the air, remaining until the crowd started to leave. Again they crossed the Hudson River and taking the plates to the newspaper office, succeeded in developing them into prints before the arrival of the photographers who had covered the fight from the ringside. It was an illustration of the speed of the airplane and the practical and speedy efficiency of the Fairchild camera and auxiliary apparatus.

Then there is the case of the old frigate, Granite State, which burned to the water and sank at her dock at 98th Street and North River. The origin of the fire was a mystery, until officials, scanning the aerial photographs made of the fire and immediately preceding it, discovered the presence of foreign substance floating on the surface of the water along that part of the waterfront. It proved to be oil. An investigation resulted in tracing the oil to a broken pipe line on the river bottom. No factory or plant using the waterways for illegal sewerage purposes can avoid the eye of the aerial camera. It has demonstrated its efficiency in scores of cases; and has been accepted by the courts as material and relevant evidence.

There are recorded cases where companies have been able to influence the award of more than the customary amount of insurance after a fire, flood or other property damage, chiefly because they presented aerial photographs proving the extent of the damage sustained, back of the fire lines as well as the actual damage done to buildings. It happened in the case of the Erie Railroad pier fire in Jersey City. The piers burned. The damage to them was easily shown and proved by the railroad company. But when they made aerial views, showing the paralyzed state of traffic in their yards and on all their trackage, it was not difficult to convince the insurance adjusters that material damage amounted to more than the burning of the piers. It is this same "show me" spirit that has led the owners of large resorts to place in their literature beautiful aerial views, of not only their houses or hotels, but their surroundings, showing availability and proximity to transport lines and natural scenery.

The owner of a famous nursery at Amawalk-on-the-Hudson was able to secure, in one photograph, a complete portrayal of all the species and foliage, actual number of the 350,000 trees and their height. It saved sending an agent on a tour of the premises to sell prospective purchasers. All the selling, practically, is now accomplished in the office hundreds of yards from the rolling acres across which the staff formerly trudged many weary miles daily. They now sell in the front office, or by canvassing with their photographic exhibits or through the medium of catalogues containing aerial views artistically arranged and printed. The possession of a set of these aerial views has enabled many salesmen to secure the attention of a prospective customer. He is interested in the remarkable photographs. His attention once held can be sustained.

Arthur S. Tuttle, Chief Engineer for the New York Board of Estimate and Apportionment, and credited with being one of the first city officials in the country to use aerial surveys for a practical purpose, found that their value is limitless, both from the time-saving and economical points of view. He ordered a mosaic map from Fairchild in connection with the Narrows Tunnel project and marginal railway plan for the development of the New York Port.

The survey made from the air covered the proposed marginal railway territory, freight classifying yards and belt-line road, connecting all the railroads terminating in New York. His principle objects were to put the plan most comprehensively before the railroad and other executives in the quickest possible period of time. One of the most interesting facts brought out was that the aerial map revealed the location of waterfront property on Staten Island, along Arthur Kill, close to New York, yet undeveloped, while on the opposite shore of Arthur Kill, in Jersey, the aerial view brought out distinctly the active industrial conditions there made possible by excellent rail facilities.

In showing his aerial map before the railway executives and engineers, Mr. Tuttle was able to demonstrate the feasibility of his railway plans in tying up transport with the new Staten Island piers. Also, he was able to make tentative charts of the routes to be taken, without a ground survey and months spent in securing information from the ground. By studying the aerial map, he was able to avoid residential sections, graveyards, highways and other obstructions which might otherwise have

crept into his preliminary report of the proposed right of way.

Hotels have used aerial photographs in their advertising, showing patrons how centrally located they are in respect to other districts, such as the railroads, theatrical and shopping centers. Ports, Chambers of Commerce and suburban towns have benefited to remarkable extent by aerial advertising. The American Red Cross recently exhibited aerial views of New York's East Side, showing the lack of playgrounds and the congested tenement district. It was another way of telling the public how the foreign population lives. Scenes on the many square miles of flat-topped roofs remain a constant reminder of congested conditions which civic and charitable organizations are trying to remedy.

This accurate portrayal of built-up sections and the wasted or uninhabited districts are matters for industrial and economic experts to consider. Not long ago a committee was appointed to ferret out the reasons why one side of a small stream in New York State was built up with factories and homes while the other side had remained barren. It seemed a simple assignment, yet none of the reasons advanced was proof against argument, until an aerial map of the entire territory was made. There it showed conclusively the trend of building and occupation had followed the railroad on that side of the stream. On the other there had been no railroad to provide the transport necessary to progressive industrial and civic development.

By far one of the main considerations of aerial photography is its saving in time and money. Securing a clear detailed vision, permanently, of areas under development, or plots damaged by fire, flood or storm, taking out timber or protecting that timber from forest fires, swamp drainage, excavating or municipal improvement, is economical. One or two cases in point may serve to illustrate this economy.

The Fairchild camera man left Curtiss Field, at Garden City, Long Island, N. Y., in a Curtiss standard plane. Over Port Washington he photographed the entire village; thence to Mamaroneck, N. Y., a school for girls was photographed; over White Plains, completely photographed, also Gedney Farms. On to North White Plains where a view was made of the town; then to Kensico Dam, so large that ground photographers cannot get a complete view of it. The aerial picture gave it all, including the surrounding hills and watersheds. On to Croton Dam, he duplicated the work there. Over to Valeria Homes, where photos were made for engineering data and advertising displays, showing the plans for new buildings and building operations already under way; there also were taken views of the infested mosquito swamps and drainage system, giving in detail the enormous amount of work done, which incidentally gave a reason for the expenditure of the appropriations. The plane then went on to Peekskill, where the big Yeast Plant was taken; on down the Hudson Valley where a school was photographed, also John D. Rockefeller's estate, then the Sleepy Hollow Golf Course, Spuyten Duyvel, the United Electric Light & Power Company's Plant, the Bronx Concourse and finally the new electric plant on 133rd Street in the Bronx. In all 84 aerial photographs were taken during the flight —80 per cent. of which were perfect and sold.

On another occasion Fairchild sent a camera man out of Port Washington in a plane and he made photographs of the Consolidated Gas Company's Plant at Astoria, L. I., Newton Creek Realty Corporation, showing details of property, its location relative to the Grand Central Station, the 59th Street Bridge and the broad highway leading through the property and over the East River right into the heart of New York. From there he went over the Austin Nichols Plant and made several close-up views for a special newspaper edition, the Drake Cake Factory, the Baker Shoe Factory, the Bliss Machine Tool Company who wanted their five buildings shown to best advantage for calendar purposes, the S. S. *Paris*, departing from New York with Premier Briand aboard, and then over the Bay to Port Newark, which was photographed from high altitudes, thence to the William Shupe Lumber Company, which used the photographs to announce their removal from Orange to Newark on the Passaic River, and incidentally to show their proximity to New York City and the heart of Newark; thence over the city of Newark, where clear views of traffic, main streets, and residential sections were made (and later delivered) still on to the submarine Boat Corporation showing New York and its harbor in the background, then down to the F. M. Taintor factory where Paris White is made. The views taken over that plant showed the narrow gauge railway system, shipping facilities and magnitude of the plant itself and were taken for the benefit of customers, to impress them with the substantial character of the Taintor works.

The views when completed actually bore out the assertion of H. E. Bessom, Editor of the *House and Trade Journal*, who said, "The ground view does not do justice, a wash drawing is usually unconvincing and is discounted; but that the aerial view pushes back the horizon, and one gets a different perspective with two sides and the

top of all buildings, no matter what may be on the ground in front of them."

It is the forethought back of aerial photography, together with light and simple equipment made up in compact units, that has brought about the present successful development. It would require a visit to the aerial photo studio to present all of the problems and difficulties which numerous inventions have solved in recent months. With this kind of equipment the operator needs only to link up his aerial view with landmarks and other things that make the picture interesting—just as one would do in any successful photographic venture. To do this successfully is to find a ready market for aerial views. The factory which recently purchased views to reproduce on its shipping tags was following the line of least resistance in giving every person who saw the tag a conception of the size of the institution from where the goods were shipped.

This idea is being developed into another branch of the business. It has led to stocking prints, or to explain, saving prints of growing sections of city or country. By continuously taking photographs, say at regular intervals, one has a detailed history much easier to look at than musty diaries or old, forgotten town hall records. This thought has penetrated the real estate business and offered it vast possibilities. The possibilities are as effective as the strength of the camera itself which, due to the recent improvements, is now able to penetrate the thick blue haze which hangs over New York City almost continuously night and day, penetrate that haze, we repeat, and from high altitudes secure detail; for example, at 8,000 feet in the air, in one single photograph, fully 13 miles of the metropolis lying like a toy city of building blocks under its mantle of blue.

There is another use for the aerial camera—the line map. Maps must be made wherever human beings would live and prosper, or traverse the trials once made over land and sea. The photographic mosaic, or aerial map can be easily made into a line map by eliminating non-essential details, and it is being done wherever occasion requires.

Within the last few days Fairchild has completed arrangements with Laurentide Air Service, operating for the Laurentide Company, of Grand Mere, Quebec, Canada, to plot and develop aerial photographs of 1,500 square miles of their timber holdings in the North country. From the aerial photographs, the foresters can count the number and tell the approximate size of the various kinds of trees. They can see burnt over, blown down, and cut over areas. They can literally do their lumber cruising in the office, quicker and at less expense than by the old method of sending timber cruising parties through the forest. The aerial photographs will be used as a check on the work done, to make sure that all cut timber is drawn out. With the photographs they will discover logs left on the banks of the river and they will be able to count and estimate the number of logs in the log booms. The aerial camera will find all these things and keep them on record permanently, just as it found all of New York City and everything out-of-doors.

Aerial photography will increase in use and importance until it is an everyday part of routine business just as ordinary photography is employed by every business and industrial institution today. This development will not only progress with the popularity of aviation. It will constitute one of the principal functions of the airplane. Not only will aerial mapping and other kinds of aerial photography come into general use among civilians, but also with Governments. If it were to be used only for pioneer work, such as the preliminary surveying of the vast unchartered areas here, throughout the North American Continent, in all nations of South and Central America, the aerial camera would have steady and continuous employment for a score of years. Aviation authorities credit it with being one of the most progressive and profitable branches of aeronautics today, and one which will develop with considerable rapidity.

Were one to visit the Fairchild Aerial Camera Corporation, he would understand the stability of an organization required to develop an efficient aerial camera and produce the many different kinds of photographs which highly specialized character require. Not only competent photographers and camera men must be trained in this branch of camera work, but paper, lay-out, developing, machine operating and intelligent chemists, engineers and mechanics for laboratory work are included in the staff, each one of whom contributes his individual share in producing a picture of distinction.

Preservation of Negatives

In answer to an inquirer, the editor of *Photo-Revue* advises placing between each pair of negatives a piece of white paper which has been previously soaked in a 5% solution of potassium bichromate, dried and exposed to daylight. The negatives are laid, of course, with films facing. The action of the prepared paper is not explained, but it is stated that it is an advantage for preserving in contact negatives that have been developed by different methods.

Aurantia as a Desensitizer for Developing Papers

Aurantia, a yellow dye, derived from tar, has a marked desensitizing action on silver salts, as was first stated by Lumière and Seyewetz, who recommended a solution in acetone as a substitute for phenosafranin. It was soon found, however, that this solution has a very irritating action on the skin, and, in addition, the vapors of acetone are objectionable. A somewhat dilute solution of the color in alcohol has been substituted for the original preparation. Aurantia does not have the full protecting power of phenosafranin, but washes out more easily. This fact is of no particular advantage in working with autochroms, as the oxidizing solution, which is used to reverse the image, removes the dye, but aurantia is recommended as eminently suitable for desensitizing bromide paper, from which it is quite difficult to remove phenosafranin. The exposed paper is placed in the dilute solution of aurantia under a safe light, and after about a minute of action, it can be developed by ordinary yellow light. The usual washing will remove the color. The solution should be made with one part of the color to 1000 of water, and may be used many times.

McKinley Portraiture

The Camera Club, New York, exhibited during the month of February the work of its popular president, Mr. J. H. McKinley. His examples were all large in size and embraced character interpretations of many noted men. Their chief features were roundness and likeness.

One of the most striking renderings was that of the celebrated Norwegian explorer, Stefansson. A stronger portrayal of an unusually strong character is rarely seen. Every line and feature stood out in impressive excellence.

Carl Akeley—himself a noted photographer and inventor of photographic apparatus—is famous for his explorations and the wonderful specimens secured for the New York Museum of National History. Just now he is returning with a whole family of captured gorillas, an achievement heretofore unknown. Such a forceful character has been delightfully delineated by Mr. McKinley in a manner that makes it one of the best portraits in his collection.

F. Ballard Williams, one of our most classic painters, after the Flemish school, was charmingly depicted in characteristic expression and pose.

"Burton Holmes," traveler and lecturer, was conspicuous among the galaxy of celebrities in a portrait impossible to surpass and seldom approached.

"Col Thompson," "Admiral Sigsbee," the late "J. Francis Murphy," great American landscape painter—"Mrs. B.," "Portrait of a Boy," "Portrait of a Girl," "A Spanish Lady," "Agustus Franzen," and many others, may be mentioned as of superior excellence.

What is perhaps the best portrait of a lady in the show was that of "Mrs. Burton Holmes." For modeling expression and delightful textural subtlety it left nothing to desire, and it was at once the softest and most winsome presentation in the exhibit.

The show was much admired and praised.

Floyd Vail, F. R. P. S.

Concerning Enlarged Negatives

The following essay, by Max Schiel, of Leipzig, appears in the *Photographische Rundschau*. The general method of preparing enlarged negatives is well-known. A more important question is whether glass or paper should be used. It is generally thought that glass negatives give a better tone-gradation than paper, but the principal advantage is greater transparency. Schiel has been able to get good tone-gradation with paper. After all, the main point is that the original transparency or positive should be adapted to the purpose. Increasing the transparency of the paper support has been the subject of much investigation. If oily matters are used in sufficient amount to get high transparency, spots appear soon, which render the negative worthless. Therefore, it is better to use only one treatment with oil, which, although it does not give the highest transparency, gives a negative that will be satisfactory for several weeks. It is often recommended to warm the sheet, but this is not advisable, as it does not prevent the formation of spots. Solutions of resin have been recommended for making the paper transparent. Strong solutions of the common form (colophony) and of elemi, in turpentine or benzene, are somewhat difficult to apply uniformly, and liable to give a streaky coating, while weak solutions do not give satisfactory transparency. A further objection is that common resin gives a yellowish tint.

Schiel has used for several years the following method of treating paper negatives. The sheet is bathed in a warm, 25% solution of dammar resin in toluene (toluol). Benzene (benzol, the coal-tar product, not benzin), may be used, but it is more volatile and, therefore, more vapor is given off when the solution is warmed, and hence greater danger from fire. Xylene (xylol) will be still safer. The dry paper-negative is placed in a dish with the resin solution heated to about 80° F., allowed to remain about half a minute, drained over the dish and hung up to dry. After a few hours, the solvent has entirely evaporated and the negative is ready for use. The coated surface has a lacquered appearance, the transparency is greater than that of the untreated sheet and is uniform and permanent. The coating can be removed by the use of a cotton wad dipped in benzene. Retouching may be done on either side. During the drying the sheet may tend to curl, but a brief pressure in the printing frame will correct this. If it is desired to border the sheet with black paper, for instance, for use in gum or pigment printing, the resin along the margin should be scraped off with a knife and it will be an advantage if the gelatin coating is removed at the same time.*

Speaking Movies

Many attempts have been made to combine the talking machine with the film. The principal difficulty is to get exact synchronism; the least disagreement of the utterance with the motion will displease. A success in this field is claimed for the French house of Gaumont, and an exhibition of the machine of latest construction recently given before the French Society of Photography is briefly described in its Bulletin. The arrangement is termed "Filmparlant" (speaking film). The exhibition began with a short address made by the talking machine by which the general nature of the apparatus was described, the appropriate gestures being represented on the screen. This was followed by a lecture on aquatic life in which the microscope had been employed to produce the pictures, the talking machine furnishing the explanations in place of a lecturer.

One great advantage of this apparatus is the eliminating of the titles which have to be read by the audience, often so rapidly that many do not get the full meaning. In educational work such machines will be of great value, for it frequently happens that the lecturer is a good scientist, but a poor speaker. With the combination of phonograph or similar machine, a lecture can be written by the teacher and the record made by a person who has a clear voice and distinct enunciation. Moreover, it often happens that the teacher gets, by chance, a very good illustration of some natural phenomenon, and this can permanently be recorded on the film, so that the demonstration will include a vivid picture of the biologic or other data and a clear, distinct explanation thereof.

The exhibition at the Society terminated with the repetition of the speech of a French official made on the occasion of the interment of the "unknown soldier," the audience hearing the words from the speaker himself and seeing the gestures coincidently.

Paris Notes

AERIAL PHOTOGRAPHY AND PHOTO-SURVEYING

A revival of interest in aerial photography has resulted from the exhibition at the seventh Aeronautic Salon, held last November, of equipment for aerial photography and of examples of the extremely fine work done by the various French firms who have taken up this subject. Some new introductions were shown, notable among them two film roll-holders, one taking a hundred 18 x 24 cm. pictures made by M. P. Garnier to the specification of MM. Libman, Galiment and Lenouvel; the other, for 350 exposures of the same size constructed from designs by Captain Paumier by the Puteaux army arsenal. The latter, however, was exhibited only as a non-working model, from which it was impossible to form an opinion of its action. The Cadastral Service of the Liberated Districts showed a Rolland changing box for 150 exposures on 18 x 24 cm. plates, made by the Société Optis, and also a between-lens shutter for a 20-inch $f/6$ lens, made by the Société d'Optique et de Mécanique de Précision, which firm during the war supplied the bulk of the lenses employed in the Aviation Service. The Cadastral Service also showed in action the camera of H. Roussilhe for the correction of aerial negatives taken with an oblique lens axis.

*On account of the inflammability of the vapors of the solvents above given, it might be worth while to try a solution of the resin in chloroform, the vapor of which is so feebly combustible as to involve no danger.

An apparatus for the printing of long bands of film negatives on to continuous bands of bromide paper was shown by the Société Filmographe in the shape of a Prestotype printer of M. L. Lobel, constructed on the same principle as the cinematograph printer of the same inventor and providing the necessary automatic variations in the strength of the printing light for each negative in the film band.

During the period of this exhibition there was opened at the headquarters of aeronautic equipment at Chalais-Meudon, near Paris, an aeronautical museum, which contains a photographic section, small at present, in which are brought together aerial cameras taken from the German army. The museum is open to the public on Thursday and Sunday afternoons.

Stereo-photogrammetry, which up to a few years ago was greatly neglected in France, is now being closely studied. The Société Francaise de Stereo-topographie, recently formed in Paris on the initiative of M. P. Corbin, who has introduced these methods in France, has made an arrangement with the firm of Zeiss for the application in France and the French colonies of stereoscopic methods of making maps, and in particular for the use of the von Orel stereo-autograph, the latter an apparatus devised by the Austrian Geographic Service for the automatic drawing of maps and of their contour curves.

A French railway engineer, M. J. Prèdhumeau, with the aid of a subsidy from the Ministry of Public Works, has set out to obtain equivalent results with a much more simply constructed camera, and has made an experimental model of his "Stereotopometer," which has given every satisfaction in the course of its first trials.

It may be finally added that another engineer, M. Poivilliers, belonging to the Compagnie Francaise de Navigation Aerienne, has patented a camera based on both the Bildmesstheodolite of Hugershoff and the von Orel Stereo-autograph for the application of stereo-photogrammetry to aerial photographic negatives.

CINEMATOGRAPHY

An event of great importance in cinematography is the recent introduction of the "Mundial" cinematograph projector of the firm of Continsouza. This apparatus must be said to be not merely an improvement on existing types, but an entirely new and excellent conception. The shutter, which is of truncated conical form, is placed between the condenser and the film. Flicker is absolutely eliminated by the direction and speed of its rotation, as is shown even when the apparatus is run without a film. Wings mounted on the shutter cause it to function as a powerful fan, strongly cooling the film and permitting of any single picture being projected in the ordinary way. The film passes into an absolutely closed channel, which completely separates it from the mechanism and, moreover, provides an absolute preventive of the film catching fire. If the motor of the projector is stopped, if the fall of the safety cut-off is intentionally prevented and if the shutter is turned in the open position, the film will catch fire, but the combustion is limited to the piece of film contained in the gate and does not even extend to the perforations, so that after such an incident projection is continued when restarting the motor. The efficiency of these arrangements is such that the constructors have obtained from the authorities permission to dispense with the water cell, the use of which has hitherto been compulsory in every cinematograph exhibition.

At one of the recent meetings of the cinematograph section of the French Photographic Society, M. L. Clement, a leading authority on cellulose ethers, gave a very interesting talk on non-flam film of cellulose acetate. The difficulties which some manufacturers have had arise from the random choice of the cellulose acetate. This latter is available not as a single definite substance, but there are several cellulose acetates differing very greatly in their properties according to their source. Varieties which are the best for varnish making are not suitable for film manufacture, and *vice-versa*. The technical experts should be able to specify the qualities which a cellulose acetate should have in order to fit it for the manufacture of cinema film, and it would be easy for manufacturers to conform to these descriptions. The characteristics of a good cellulose acetate film are very little different from those of a celluloid film, and the resistance of the former to abrasion is greater. Most of the celluloid negative film, moreover, has a coating of cellulose acetate in order to prevent electrical markings.

As a result of this conference a committee has been formed to define the chemical, physical and mechanical properties required in cellulose acetate for cine

films, and the technical experts of the cinematograph film manufacturing and producing firms are represented on it. Another committee has also been established in order to endeavor to obtain an international standard for perforations and for the marginal notches indicating the required alterations in the light when printing from negative films.

COLOR PHOTOGRAPHY

An experiment which would have been very interesting if it had been carried out more strictly and systematically was recently made by the color photography section of the French Photographic Society. A number of Autochrom plates coated with the same batch of emulsion were exposed under identical conditions (the three plates of each set of three receiving different degrees of exposure) on a still life subject consisting of bronzes, flowers, and fabrics, illuminated by electric light. Each set of three plates was developed by the advocate of a particular method of development. Unfortunately none of these workers were accustomed to the illumination of the dark room in which development was done and, therefore, the results were greatly inferior to those usually obtained by them. It seems, however, that some conclusions can be drawn from this comparative test. For Autochrom plates, the exposure of which has been somewhat cut down, the best results appear to be obtained by the Lumière metoquinone developer. For somewhat fuller exposure the pyro developer recommended on the introduction of the Autochrom plates serves well. It is recognized that this developer is the best for plates which have been kept considerably beyond the date allowed for their use by the makers. Lastly, the diamidophenol developer made acid by an appreciable addition of bisulphite so as to prolong the time of development to about an hour appears to give the best results from Autochroms which have been considerably over-exposed.

M. Schitz, one of the most skilful workers of the process, has recently shown some very fine landscapes made in quarter-plate size with a 15-inch lens. The narrow angle of view requires that the foreground should be at least about 150 ft. from the camera, with the result that the atmospheric effect is to soften the colors and to avoid too violent effects. At this small angle also it is usually an easy matter to obtain excellent composition without the inclusion of the sky in the picture, thus eliminating a feature of the landscape which is almost always unsatisfactory in an Autochrom unless it presents striking features.

A NEW PROCESS OF COLOR PHOTOGRAPHY

M. Leon Didier, inventor of the Pinatype process, has recently been granted a French Patent (No. 524,143 of March 17, 1919) for a new process of color photography by printing from a negative in complementary colors (*e.g.*, an unreversed Autochrom) on to a sensitive film, or several such films, so that there is formed at each point a color complementary to that in the negative, and therefore corresponding with that in the subject.

The inventor sets forth as follows the conditions to be fulfilled:—The three series of reactions, each corresponding with the production of a primary color, should be chemically and optically independent; fixation should be possible for the three sensitive films by a single reagent, or, at any rate, by reagents which can be mixed together.

The leuco compounds of certain dyes alone or in a mixture with other substances are sensitive, particularly to rays complementary to the color which the compounds assume on exposure to light. For the production of the yellow image other reactions may be employed, taking place only under the influence of the actinic blue and violet rays. Fixing is to be done in a solution of monochloracetic acid, with addition of stannous chloride.

THE CONSTITUTION OF DEVELOPERS

A few months ago M. M. Abribat, in a paper before the French Chemical Society, pointed out that he had been able to develop photographic plates by means of products obtained by the action of sulphurous acid on a solution of fuchsine or malachite green. To these solutions, in which M. Abribat admitted the presence of the corresponding leuco bases, carbonate of soda was added at the time of use. Although without any practical interest, this observation had a certain importance, since it represented an exception to the law laid down by MM. Lumière on the chemical constitution of organic developers. MM. Lumière and Seyewetz, in repeating the experiments, have shown, on one hand, that the method of preparation does not yield the leuco bases, but carbinolic bases, and, on the other hand, that in a pure state neither

these compounds nor the leuco bases possess developing properties.

MM. Lumière and Seyewetz have shown at the same time that the images developed with indoxyl or thioindoxyl, according to Homolka, are due to a very different reaction from those which take place in the use of the customary developers, and that such images, whilst very weak, do not contain (in addition to the coloring matter) metallic silver, but most probably silver sub-bromide.

STEREOSCOPIC WORK

M. G. Potonniée, one of our most enthusiastic searchers of documents relating to the history of photography, has recently drawn attention to two drawings made by J. Chimenti (1554-1640) which are in the Wicar Museum at Lille. These two drawings form a beautifully drawn stereoscopic pair made two centuries before the invention of the stereoscope by Wheatstone.

M. Guérin, maker of the well-known Leroy stereocycle, in collaboration with M. Delens, has recently designed a very compact new model of magazine stereoscope, in which the transparencies are handled with great speed and certainty. Its all-metal construction leaves nothing to be desired as regards mechanical perfection.

NOTES AND NEWS

The Institute of Theoretical and Applied Optics, established in Paris, at 140, Boulevard du Montparnasse for the training of constructors and workpeople in the scientific instrument trade, have just commenced the publication of a monthly journal, "La Revue d'Optique." The director of this Institute is M. Charles Fabry, Professor of Physics in the Sorbonne, to whom the Franklin Institute of Philadelphia recently awarded one of the Franklin Medals for his optical researches, in particular in spectroscopy.

The great success of the competition organized by the "Revue Française de Photographie," particularly in regard to the standard of the work submitted to the judges, denotes a reawakening of pictorial photography in France. Moreover, a Salon of Photography will probably be held in Paris in 1922 under the management of a group of the principal photographic societies in conjunction with the "Revue Française," thus restoring a feature of French photographic activity which has been dormant for nearly ten years. The difficulty in obtaining a suitable place for such an exhibition is likely to limit the number of works which can be shown, but upon however modest a scale the effort is made it is bound to have a highly favorable influence upon the progress of pictorial photography in France, where the high price of photographic requisites has had a strongly deterrent effect upon this branch of the art.

The annual meeting of the French Society of Industrial Chemistry, held in Paris during the second week in October, announced a section devoted to photography. The announcement of the congress, however, was made so late that, for lack of anyone to take part in it, a meeting of this section could not be held. Sir W. Jackson Pope addressed the general congress on the future of the organic chemical industry, and was awarded the gold medal of the Society of Industrial Chemistry.

Several Parisian newspapers recently reprinted an article from the *Times*, according to which synchronism of movement and speech in cinematograph projection "had just been discovered." M. Leon Gaumont, who in 1901 solved this problem, with the help of his colleagues, has since perfected it, and has on many occasions given public demonstrations of his Chronophone or Talking Film (notably in 1902 and in 1911 at the French Photographic Society), has naturally been prompted by this announcement to draw attention to his invention. At a meeting of the French Photographic Society on October 28 he again gave a performance of several talking films. The present apparatus is certainly capable of further improvement as regards the quality of the sound and the means of register, but nevertheless it achieves absolutely the automatic synchronization of a cinematograph and a phonograph.—L. P. CLERC, *in the British Journal of Photography.*

Some Remarks on Making Reliefs

It has been known for a long time that bichromated gelatine loses its property of swelling in water after it has been exposed to light. This peculiarity of the combination is taken advantage of in the making of relief photographs.

Recent experiments in this line have greatly improved the early methods. These experiments build upon another characteristic which the bichromated gelatine exhibits; a kind of contraction which it

undergoes when it is subjected to a moderate degree of heat.

A film of gelatine made insoluble by exposure to light, when gently warmed is found to contract less appreciably than one that has not been exposed.

The relief occurs not only in the parts of the film most strongly exposed, but also proportionally throughout the gradations of light and shade, but the contraction, and the relief thereby secured, are more noticeable where the film is damper.

It becomes manifest, therefore, that the gelatine which has become insoluble, even at a considerable temperature, does not absorb water and so does not acquire this property and hence contraction is less.

It is obviously essential in employing the gelatine coating mixture on the plate that it should be dry, otherwise it cannot be used for exposing under a negative, but fortunately gelatine, even in a practically dry condition, still retains the moisture needed for the relief. In order to secure uniformity in results and also to get all the depth of relief possible, it has been found advantageous to add a small percentage of glycerine to the gelatine.

Glycerine has the same effect as water; but the advantage that unlike water it does not evaporate under moderate heat, besides it has the property of attracting what water there is in the seemingly dry film, preventing it from evaporation, thus contributing to the relief.

The following formula has been found to work well:

Gelatine (the kind used for gelatine plates)	462	grs.
Distilled Water	3½	ozs.
Pure Glycerine	1	dr.

Prepare the mixture in the water bath, and warmed until a froth appears on the surface. Filter, to separate from this froth, through fine cheese cloth. If any froth persists in the filtrate, remove by use of a strip of card.

Now heat up to from 120 to 140 degrees Fahr., and apply to a clean polished zinc plate, previously warmed and kept perfectly level to insure uniformity in the film. A waxing around the edge of the plate prevents any dripping. Any air bubbles should be removed before the setting of the mixture. Let the plate remain in position till dry. The plates keep indefinitely if protected from dampness.

Sensitizing is as follows:

Ammonium Bichromate	9.25	grs.
Water	34	ozs.

Sufficient ammonia to change its color to canary. Let the plate remain immersed 15 minutes, sensitize under weak light and dry in the dark without employing artificial heat.

A clear, strong, rather contrasty negative must be used and print under close pressure. Time of exposure averages 30 minutes in sunshine. Progress may be noted by observing the change of color of the plate around the margin. The edges should show a chocolate tint.

After printing carefully, heat the zinc plate. Do not scorch the gelatine. Development is effected by bathing in water, to which a two per cent. solution of alum is added and two per cent. of acetic acid. An hour's immersion in this solution effects a strong relief from which etchings may be made or castings by galvano plastic means.—*(Photo-Cronik.)*

Carbon in Winter

The experienced carbon printer has a pretty good idea as to the atmospherical conditions necessary to the production of good work; but the beginner who gets started in the spring or summer usually gets into trouble about this time of year, when cold, damp and dull days are to be expected. It is a good plan to assume that conditions which make for personal comfort are also those which are favorable to carbon printing; an equable, fairly warm temperature and a rather dry atmosphere will remove most of the seasonable troubles of the process. Cold and damp mean rapid deterioration of the tissue if it is left exposed to the atmosphere for even a short time while continuing action goes on so rapidly that it is often not suspected, and correct exposure becomes difficult. Recently we found a batch of prints much under-exposed, and put them aside to "pick up" a little. It was a damp day and the walls were almost bedewed. In two hours the prints proved to be fully exposed and developed well. Now if the first prints had proved right, and the development of the remainder had been delayed, the later ones would have been spoiled, and the exposure blamed by the fair-weather operator. Another difficulty often arises in damp weather in stripping from the temporary support. If the transfer paper remains on too long, before it is quite dry it often refuses to strip, and print and flexible support are both wasted. The best way to secure good prints with the minimum of

worry is to work in a warm room free from gas or coke fumes; if possible, printing in the same room by a mercury-vapor lamp and using an electric fan to accelerate drying when transferring. The artificial light insures printing being done in time to develop the same day, for if prints have to be left on the negatives all night in winter weather they are seldom worth developing next day. All sensitive tissue and exposed prints should be kept in a calcium box with even more care than is needed for platinum papers. Finally, it is necessary to give ample time for the wax supports to harden, as the turpentine evaporates more slowly at low temperature.—*The British Journal of Photography.*

Photographing on Copper

We have been shown a number of most pleasing reproductions on copper plates, which are certainly a novelty, and might be introduced for a variety. The photographer's primary object was to employ the image produced on the metallic surface for etching with acids, but in our estimation the picture might be advantageously employed as a photograph. His method is as follows:

He takes a perfectly smooth and thoroughly clean plate of copper, made so by cleaning with some acid and thorough washing. The plate is dried by heat and placed in a bath of—

Copper sulphate	125 gr.
Common salt	70 gr.
Magnesium chloride	10 gr.
Sulphuric acid	10 dp.
Water	2 oz.

Immerse for a couple of minutes, then wash freely in water and thoroughly dry and gently polish the surface with a piece of soft flannel. Do all this in diffuse light. Expose under a negative for ten minutes or more to sunlight. Fix in

Hypo	1 oz.
Water	10 oz.
Nitrate of silver	10 gr.

The shadows at first take on a violet tone, which turn to a rich, velvety black.

Immediately withdraw and gently wash in a tray of water, but do not let the tap run over the surface. Dry rapidly over a spirit lamp or Bunsen burner, but be careful not to touch the surface, as the slightest rubbing removes the powdery deposit.

You must finally protect the film by some transparent varnish.

Photographic Fair, London, 1922

EXHIBITION OF AMERICAN PICTORIAL PORTRAITURE TO BE HELD AT THE ROYAL HORTICULTURAL HALL, WESTMINSTER, LONDON, FROM MAY 1 TO 6, 1922, INCLUSIVE.

It has been the custom in connection with the conduct of this Fair to present an Exhibition of Pictorial Portraiture by British photographers, but a departure is made this year by confining the exhibition entirely to a display of American Pictorial Portraiture.

This is a great opportunity for American Pictorial Portraitists to bring to the immediate attention of British photographers the pictorial work of this country, and American Portraitists will do well to timely heed the kind invitation. Our work will thus be presented to a wider publicity than it would be possible in any other way. Fail not to do your part. The Exhibition is held from May 1st to 6th. Several copies of the Prospectus and ENTRY FORMS have been sent to us so make your application at once, as, naturally, the stock of forms is not inexhaustible.

The beautiful Silver Georgian Cup, as illustrated, will be awarded for the best group hung of not more than six pictures.

THIRTY-GUINEA SILVER CUP

Judge - WILLIAM CROOKE, ESQ.

(No Entrance Fee.)

Some idea of the popularity of the London Photographic Fair may be gathered from the fact that the whole of the available floor space of the Great Hall, let to manufacturers for exhibits of apparatus, processes, etc., was applied for within ten days of the prospectus being issued.

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636 SOUTH FRANKLIN SQUARE, PHILADELPHIA

PHOTOGRAPHING TREES AND GROWING PLANTS—WILLIAM S. DAVIS

THE making of tree studies affords a year 'round hobby for the outdoor photographer who enjoys following up a definite class of subjects with the intention of gathering a representative collection of views, since with the exception of evergreens, a change of season entirely alters their aspect, and exposures must be made at different times to show seasonal variations.

If one wishes to secure a series showing such an annual cycle of any familiar species, rather than a casual collection of tree pictures, the late winter or early spring months is a good time to begin, as typical specimens can be found in a leafless condition, revealing clearly the general struction, not only of the boll and larger branches, but also the light limbs and twigs. An interesting comparison can be made between different kinds, by showing the wide divergence in the curves and position of these parts, which affect the general appearance of the whole.

When making a photograph of a leafless tree for a nature study, it is desirable to select a good specimen standing out against a simple background, such as the sky, expanse of water, or distant hillside, or, in the case of those most often found in groups, try to secure a small clump sufficiently separated from others to permit of showing the details of the lighter branches clearly. If it is impossible, in some instances, to find a viewpoint from which to show a desirable specimen, without interference from distracting objects in the background, the difficulty can usually be overcome by choosing a day for making an exposure when the distance is enveloped in thick haze or fog.

Should it be impracticable to show enough of the landscape in a close view to give a good idea of the natural environment of a species, supplementary studies might be added to indicate the nature of the country, whether

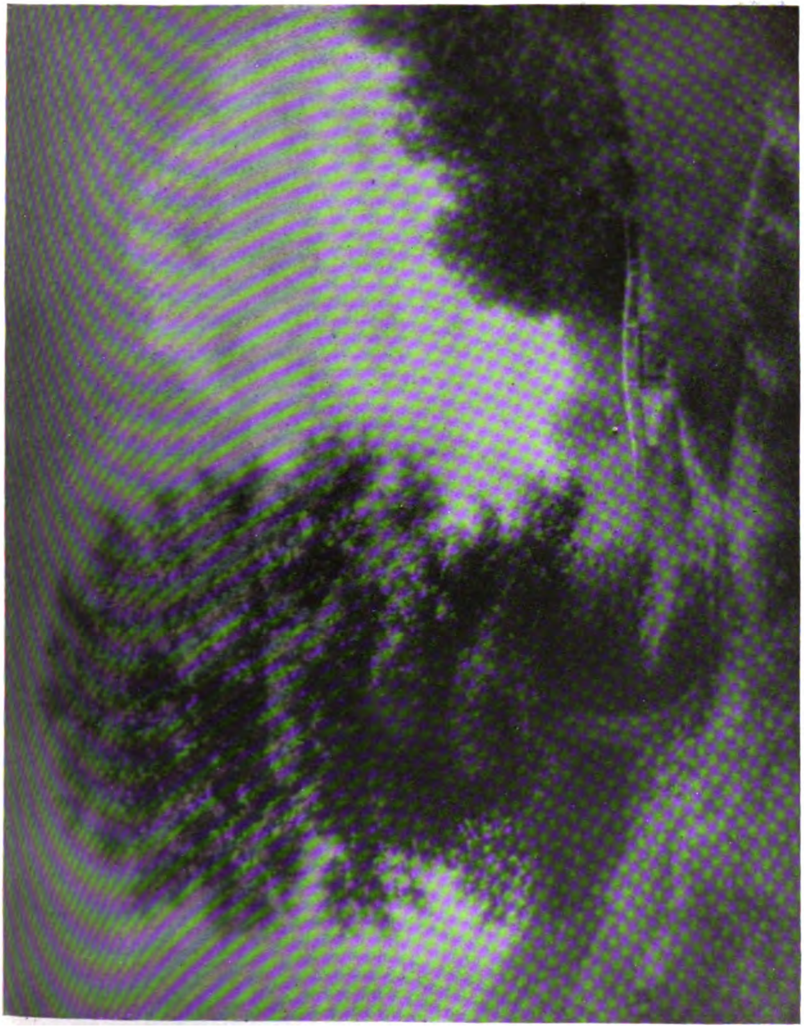
hilly, open country, vicinity of water, etc. Of course, such views might be taken at any season of the year, according to convenience or preference.

As various factors, such as age, altitude, etc., often cause individual divergence in aspect among specimens of the same species, it is instructive to make records from more than one of each species selected for observation.

The next seasonal stage to be shown in a series is the expansion of the leaf buds, and as these can be observed upon close examination before any material difference in aspect is visible when the tree is seen from a distance, a few twigs, or at most a small branch, will illustrate best this period of development, but a little later (and when spring gets fairly started, changes are rapid) the opening of the young leaves will clothe the tree in a diaphanous mantle, affording a subject for another general view as well as detail studies. Now is as good a time as any to secure a "close-up" of a part of the boll for the purpose of showing the character of the bark, and if the spread of the roots are distinctive enough to be of interest, these should be included with the boll.

When the tree blossoms show themselves, another chance is presented for attractive detail studies, and after this period is passed the foliage of most species has attained its full thickness, affording material for midsummer subjects. For the sake of completeness, an exposure should be made in autumn

"WILLOWS IN SPRING FOLIAGE" WILLIAM S. DAVIS



"NEAR HARRISBURG" W. E. MACNAUGHTAN

From the Exhibit at The Camera Club, New York

"PECONIC BAY" W. E. MACNAUGHTAN

From the Exhibit at The Camera Club, New York

after part of the foliage has fallen, although, without the aid of color, no really adequate impression of autumn foliage can be given, and to add more variety to the series, some good snow scenes, especially those representing heavily laden boughs, might well be included.

While the primary purpose of making such series is to secure a consecutive visual story of the subject, there is no reason why many of the pictures should not possess pictorial beauty as well as illustrative interest.

To make each series most useful for reference, the prints should either be placed in a loose-leaf album, to permit of keeping each group of studies in regular order, or mounted on uniform size sheets and numbered consecutively, starting with those made earliest in the season, adding thereto a clear, brief descriptive title. A neatly typed leaf of the same size, containing one's personal observations, or a summary from some reliable text-book, might also accompany each print. If accurate color notes are made from nature, many of the finished prints may be tinted to advantage.

What has been said about trees applies for the most part to forming a collection of plant studies, though in many cases the most important changes can be covered in a shorter period, as, for instance, the ferns, which reach a normal degree of development a few weeks after the fronds commence to uncurl, after which there is little, if anything, more which can be shown in a

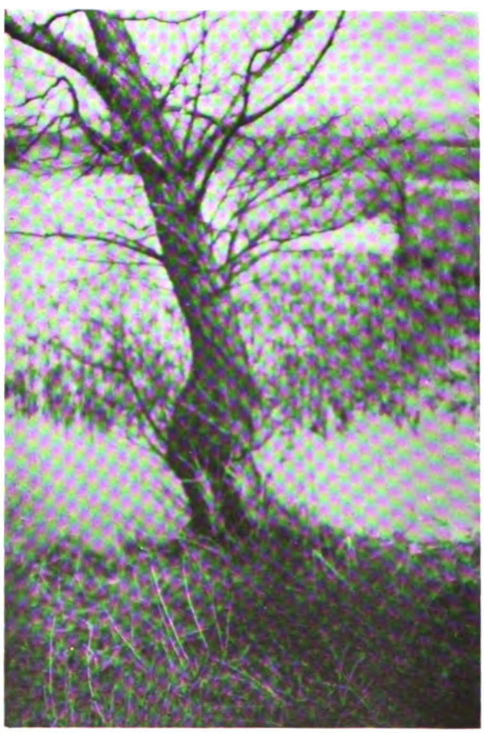
"PLUM-TREE BRANCHES IN BLOSSOM" WILLIAM S. DAVIS

photograph. As to flowering plants, the buds, full blooms and seed-pods constitute the most interesting stages, and these may sometimes follow one another quite rapidly, or extend over a period of some months.

If one has not cultivated a knowledge of trees and plants to the extent, at least, of being able to identify readily the common varieties, investment of a few of the many excellent handbooks, written in a popular style, will render the acquirement of such information easy, and there is no question but what an acquaintance with such features of nature adds interest to every ramble in the country or large city parks.

As to the question of apparatus and methods of working: A view camera, or other folding type provided with a focusing screen, in a convenient size, and possessing ample bellows capacity, is without question the most suitable for the purpose, since each subject down to within a few inches from the lens can be accurately focused and composed; a bellows extension double the equivalent focus of the lens making it possible to show small portions of an object natural size. A good, firm tripod is a necessary adjunct, since much of the material cannot be secured unless the camera is stationary.

If a camera of the type described is not available, considerable excellent work can be done with the popular roll film instruments, but at greater inconvenience, and with less certainty of getting exactly the result wanted when



"WILLOW IN EARLY SPRING" WILLIAM S. DAVIS

subjects are at very close range. The scope of such cameras is considerably increased, however, by adding a supplementary lens (usually called a portrait attachment) to the kit to be used for subjects nearer than the shortest distance given upon the focusing-scale. To be certain of getting a sharply focused image, the directions of the makers should be carefully followed and the distance from lens to subject measured by a tape line. It is also wise to use in such cases a rather small lens aperture, particularly when all of the object photographed does not lie in the same plane, for the difference of even a few inches between the nearest and furthest parts of a nearby object will cause a decided variation in definition if a large aperture is used. When the image can be studied on a focusing-screen, it is often advantageous to introduce some softness of definition in the background parts by adjusting the size of stop to secure just the amount of diffusion wanted, but this cannot be done accurately by scale, for which reason it is better to secure increased depth of definition by means of a small aperture.

While sufficiently good definition is called for to show clearly the surface texture, and delicate details of structure in close views of objects, the desired result can be attained with a very modest priced lens equipment, for as very large apertures cannot often be used on account of decreasing the depth of definition, there is nothing gained by employing a very rapid lens—the moderate priced rapid rectilinear, or even a single achromatic, when stopped down, answering all practical needs.

The equivalent focus of the lens should not be shorter than the diagonal of the plate used, since less than this is liable to cause the user to select too near a viewpoint to the subject in an endeavor to make the image large, the result being to exaggerate the apparent size of the nearest portions when any depth of perspective is present. The effect of this is very noticeable with such material as a spray of tree blossoms, or flowers, the petals nearest the lens being out of all proportion to those only a few inches back of them.

When possible, it is advisable to keep the planes of the subject near together, both to avoid the effect just alluded to, and the necessity of using a very small stop, but in case this feature cannot be controlled, the best thing is to select a viewpoint further removed, trusting to subsequent enlargement, or the employment of a longer focus lens to make the image the size desired. By so doing one will find it easier to focus sharply upon a plant group or tree branch, and the nearest and most receding parts will appear more natural in relative size.

Color-sensitive emulsions are a necessity for truthfully representing most subjects. The ortho. or iso. varieties, being sensitive to green and yellow, answer well for all subjects except those containing an appreciable amount of bright red, for which a panchromatic grade is needed. While the results without a ray-filter are generally much better in the matter of rendering the luminosity of the yellow and orange tints than can be obtained upon plain emulsions, a suitable yellow filter is called for to produce the best-balanced rendition of all the colors present, since to secure the visual brightness of the

so-called warm colors the action of the over-active blues and violets upon the film must be retarded by means of a filter. For general utility, a light shade of yellow, such as that of the Ingento series "A" or Wratten K1 filters, is advised, being sufficient to give satisfactory correction upon most subjects with the minimum increase in exposure, but it is desirable to have in reserve a second filter of about twice the strength, say an Ingento "B" or Wratten K2, for use when more decided emphasis is wanted in yellow or orange tints. The exposure factor for any filter varies with the sensitiveness to yellow of the plate or film with which it is used, from three to five times increase being right for the first mentioned grade of filters in connection with most orthochromatic emulsions, while a panchromatic plate, owing to its extra sensitiveness to yellow as well as red, will only require about half this multiplying factor. Practically every subject exhibiting a variety of color can be rendered better by employing a ray-filter, consequently one should be used unless the danger of movement of the subject by a passing breeze renders it inadvisable to risk the longer exposure necessary.

A side-lighting shows effectively the contours or "modeling" of trees and plants, and brings out the more minute details in surface texture of various parts as well. In most cases a rather low angle of illumination and diffusion of the direct rays of the sun by thin clouds or haze offers the best means of preventing the appearance of spotty high-lights, caused by reflections from glossy leaves. A quiet day is essential for making plant studies out-of-doors, though protection from a slight breeze can sometimes be given a small subject by erecting a wind-break of cloth attached to light stakes. A plant with only

"WILD FERNS" WILLIAM S. DAVIS

ESTHER VAREZ FLOYD EUGENE VAIL

From the Exhibit at The Camera Club, New York

"THE MERRY WIDOW" W. FRANK GOODNER

one or two stalks might be held securely by sticking a soft wire rod into the ground back of each stem and carefully bending until it conforms in shape to the latter, when the two are tied together by dark thread.

The background should be as simple as possible in detail and possess enough contrast in tone to set off the object Sometimes a little preliminary work in clearing away undergrowth will produce the desired effect, or casting a shadow upon the portion forming the background may change the tone enough to accomplish the same result. If no other method can be found, an artificial background can, of course, be erected, but as the main purpose of making such studies in the open is to show the subject in natural surroundings this should not be done except as a last resort. Outdoor studies may, however, be supplemented by details from parts of the subject, which are most easily made indoors by a side light from a single window. A small iron vise, which can be clamped to a table, chair-back, or other handy support, is useful for holding a cut branch in a natural position. More delicate material can be kept in place by embedding the stems in lumps of soft clay or a basin of wet sand, if the usual method of arranging in a vase of water does not prove satisfactory. By the way, any plant or flower specimens capable of absorbing water readily through their stems had best be placed in water for several hours before a photograph is made of them, as this gives the leaves and flower petals a chance to recover from the wilted appearance often noticed when first picked, and also practically overcomes the danger of their drooping during the exposure.

Exposures, whether indoors or out, are best timed by the aid of an exposure meter, but don't fail to make allowance for the nearness and color of the subject, and if sharp contrasts are present an extra fifty per cent increase should also be given. Objects within a few feet of the camera need from two to four times as much exposure as similarly lighted material a hundred feet or more away, and when small specimens are photographed to almost or quite their natural size, the extra distance between lens and plate reduces the effective *f* value of the stop used in direct proportion to the amount of extension. Thus, when the lens is racked out twice the normal distance from the plate in focusing an object to equal size, *f*16, for example, becomes for the time being *f*32.

Instead of presenting a single series of illustrations the accompanying ones were selected by way of suggesting some of the different phases of the work. "Willow in Early Spring" shows a single specimen against a background of sky and water, emphasis being placed upon the form of the trunk and small branches. "Willows in Spring Foliage" suggests the affinity of the willow for a moist location, which in this instance happened to be the bank of a small pond, and the effect produced by the new leaves when viewed at some little distance. "Plum-tree Branches in Blossom" indicates some of the close-up work to be done in the open by selecting a suitable time for making exposures—in this instance quite late in the afternoon—while the last one, called "Wild Ferns," is indicative of the field presented for showing plants in their natural surroundings. Incidentally, the character of the bark on the group of cherry trees in the foreground is also shown.

PHOTOGRAPHY IN METEOROLOGY

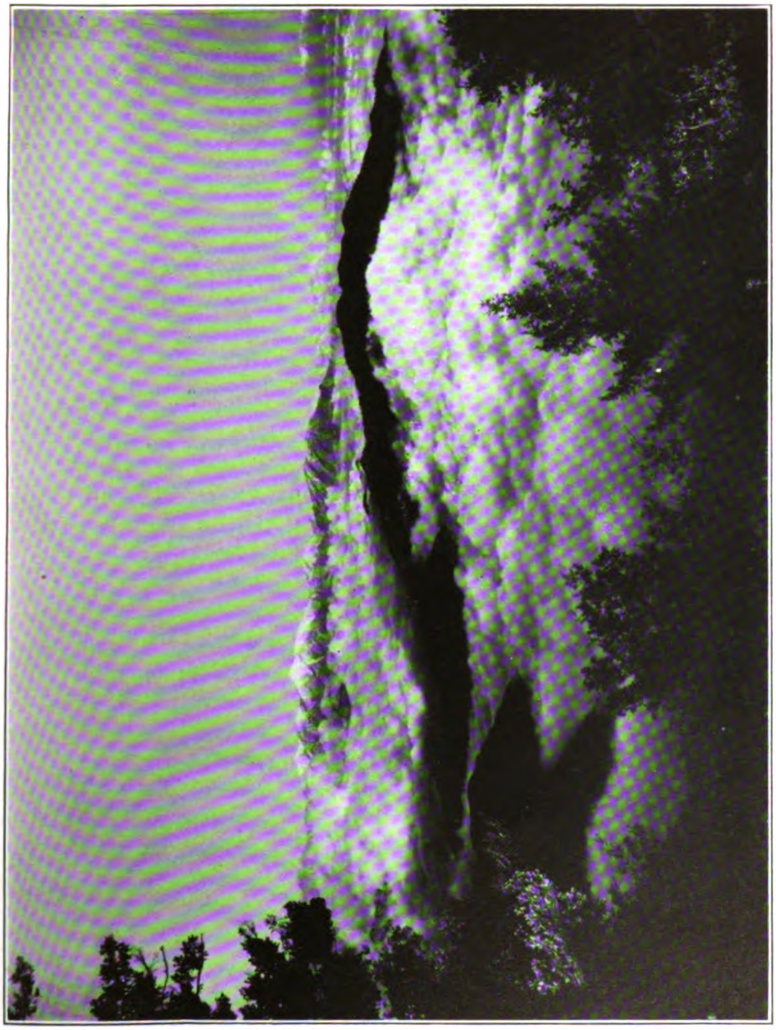
THE weather is a never-failing topic of conversation in dull company, and perhaps the very uncertainty of it is its attraction. Mark Twain said that everybody complains about the weather, but no one does anything to remedy matters. At the present time, however, it has become the subject of intense study, in which sufficient progress has been made as to the general principles of atmospheric changes to enable the "clerk of the weather" to make predictions for a day or so ahead, although it must be admitted that he is often a false prophet. International agreements have permitted a wide, simultaneous survey of the conditions, and the laws of storms have been partly formulated.

Among the most striking and familiar phenomena of the weather changes are the clouds, the impressive size and frequent mimicry of which have been observed through all the ages. Photography has been extensively applied to the preservation of cloud-forms, for in any landscape view a blank sky is an inartistic feature. Inasmuch as the cloud is generally brilliant, the exercise of judgment is required in most cases to secure distinctness of the forms without under-exposing the rest of the view. As a rule, photographic cloud work is carried on from the surface of the ground, but the development of the airplane and dirigible has permitted clouds to be studied from above as well, and a large amount of striking phenomena has been thus accumulated.

An earnest and expert investigator in this field is Dr. W. J. Humphreys, Professor of Meteorological Physics in the United States Weather Bureau. His recently published work, "The Physics of the Air," is a comprehensive study of the atmosphere in all phases. A more recent contribution has appeared in the issue of the *Journal of the Franklin Institute* for February and March of the current year, under the title "Fogs and Clouds." After presenting explanations of the several physical changes that occur in evaporation and condensation, the peculiar conditions under which clouds, fogs and mists are developed are described. Much information has been obtained on this point by recent researches, which have shown an intimate relation between the development of such phenomena and the presence of suspended particles in the air. Whenever ordinary air, containing moisture in invisible association, is suddenly expanded in a closed vessel, a miniature cloud develops; subsequent expansions of the same air develop less and less of cloud and finally none. If air is filtered through a cotton plug or other substance that will remove suspended particles, condensation by moderate expansion is impossible. No cloud forms under such conditions, but the admission of a little smoke restores to the air the power of producing the cloud. It is therefore the minute particles suspended in the air that determine the formation of clouds in most cases, although it has been found that certain gases have a limited action in this respect. It has also been found that

cloud formation will occur in air influenced by certain electrical and radioactive agents, but these conditions are not considered as occurring in nature.

An important factor in the action of the air is the "dew-point." This is the temperature at which a given mass of air will begin to deposit moisture. The power of air to hold moisture increases very rapidly with increase of temperature, and the discomfort that we feel in moist air is not due to the



Advection fog, seen from Mount Wilson, Cal. (F. Ellerman, photographer)

Courtesy of The Franklin Institute

(HUMPHREYS—FOGS AND CLOUDS)

absolute amount of water present, but to the relation that this amount bears to the capacity of the air to hold it; that is, the nearness to saturation. The figure expressing this relation is known as "relative humidity." The oppressive days in an American summer are not by any means due wholly to the heat; the distress is caused by the fact that the air is so nearly saturated with moisture that the perspiration accumulates A cold, wet day in

winter is also uncomfortable on account of relatively high saturation of the air, although in this case the amount of moisture is actually much less than in the summer. The deposit of dew is the loss by the air of the excess moisture when cooled. Dew is merely a collection of water vesicles at the low level; clouds are similar collections at high levels with clear air below, but if the water-vesicles extend from the earth's surface to a moderate

Lenticular cloud, over Mount Shasta. (C. A. Gilchrist, photographer) *Courtesy of The Franklin Institute*

HUMPHREYS—FOGS AND CLOUDS

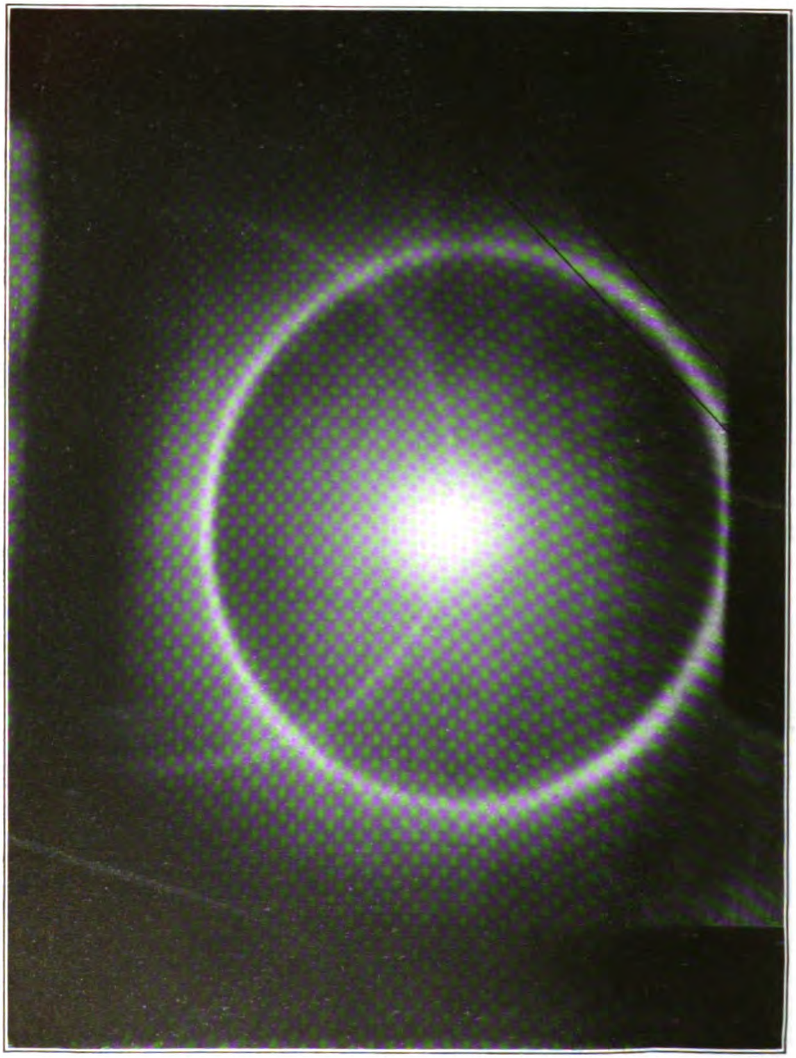
height, the phenomenon is termed fog. Consequently, it happens that the same manifestation may be called a cloud by some and a fog by others, as when the collection covers only the crest of a mountain. Those on the mountain top are in a fog; those below see a cloud. Dr. Humphreys explains in detail the manner of formation of these atmospheric conditions, but these matters need not be gone into here. The classification of cloud-

forms dates from the beginning of the nineteenth century, the first effort being due to the French naturalist, Lamarck. After many years, the International Meteorological Committee adopted, in 1910, a classification based on the appearance of the cloud. It would, doubtless, be better if the arrangement and naming could be based on the cause or mode of formation, but this seems not yet practicable.

Funnel cloud (tornado cloud)

(HUMPHREYS—FOGS AND CLOUDS) *Courtesy of The Franklin Institute*

Specific and unusual cloud-forms, or, perhaps specific manifestations, due to the relation of the sun and moon to cloud masses, are often very striking sky-phenomena. Among these are the halos and sundogs. Occasionally the halo is apparently caused by frozen water vesicles. Some years ago a remarkable halo appeared in the neighborhood of Philadelphia, at about noon. It covered a considerable extent of sky and was marked by the



Halo of 22° and parhelic circle. (Contributed by A. M. Comey.)

Courtesy of The Franklin Institute

(HUMPHREYS—FOGS AND CLOUDS)

development of two circles of rainbow colors. It was of brief duration, and was followed by a distinct fall of temperature. The phenomena of halos and sundogs are much frequent in high latitudes, and the reports of all Arctic travelers allude to them.

Common experience enables most persons to distinguish those forms of clouds that threaten storm. Storm clouds as a rule are low. The light, feathery forms that are seen in the afternoons of pleasant days are generally at a height of about five miles, but an ordinary thunder cloud may be much less than a mile above the earth. It is possible for the modern airplane to rise above the ordinary storm cloud, and those familiar with the higher mountains often observe a storm below, while they are in the sunshine.

A special form of cloud that has a most important relation in meteorology is the tornado Very high winds sometimes accompany storms, especially thunder storms, and sometimes such winds occur without rain or cloud formation. Even though much damage is done in such cases, the conditions are not considered as tornadoes. To constitute a true tornado, there must be a funnel-shaped cloud of small diameter moving at a high speed, the mass of the cloud rotating on an axis. Such effects are often called "cyclones," but weather experts are strongly opposed to the use of this term, and in all official reports the condition is called a tornado. The track of the cloud is usually only a few hundred feet wide, but within that area the most extraor-

Funnel cloud (tornado cloud), from two exposures taken close together, upper one first, seen near Elmwood, Nebr., April 6, 1919. (G. B. Pickwell, photographer)

(HUMPHREYS—FOGS AND CLOUDS) *Courtesy of The Franklin Institute*

dinary damage may be done. The length of the path is also not great, and in the middle western portion of the United States, where such disasters are not infrequent, the path is usually from southwest to northeast. In many cases the damage done indicates a reduction of atmospheric pressure in the heart of the cloud, as the windows of buildings are often blown outward. The line of destruction is generally sharply defined. The cloud hangs quite low, probably only a few hundred feet above ground. Obviously, as these conditions arise quickly and are quickly ended, little opportunity is offered to secure photographic records, but a few such have been secured which show vividly the phenomena.

"MADAME B." W. FRANK GOODNER

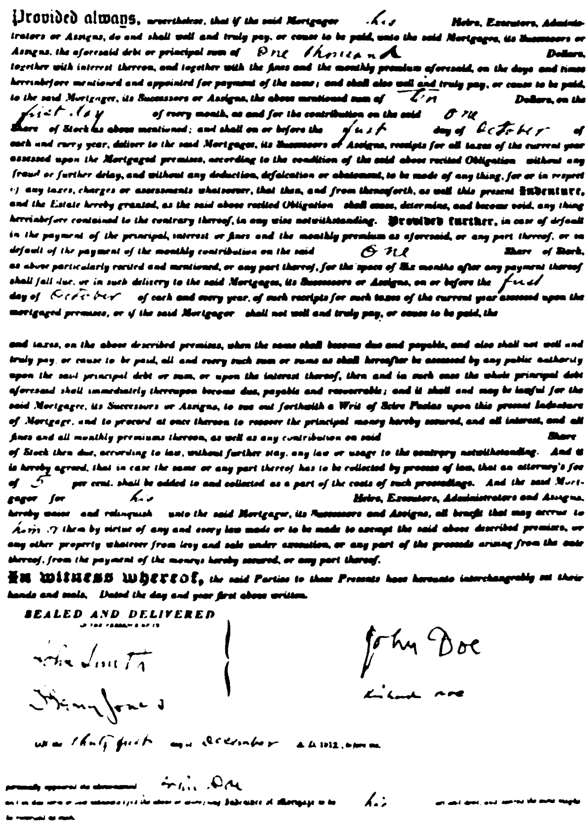
THE APPLICATION OF PHOTOGRAPHY TO THE PRESERVATION OF PUBLIC RECORDS

THE establishment of an organized government among human beings involves the recognition of the rights of property, especially in land, which is the basis of all real wealth. As land is not transportable, the ownership of it must be, in some way, a matter of authoritative record, and, accordingly, we find that in the earliest known civilizations questions of land ownership constitute an important phase of public affairs. The bargaining of Abraham with the sons of Heth for a burial ground is a striking instance of a specific transaction in land, and the clay tablets from Mesopotamia and the Egyptian records reveal to us the same features.

In modern life, many types of written or printed records are required, the making and preservation of which imposes great financial burdens upon the community. The old-fashioned methods of hand transcription are slow, untrustworthy and likely to lack legibility and permanence. In a recent issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA brief allusion was made to the application of photography to this work, and the subject is of sufficient importance to receive more detailed treatment. In our large American cities several departments are charged with the preparation and care of records of the most important character, among which are wills, deeds and mortgages. At the present time one of the largest cities of the United States is behindhand for nearly six months in the transcription of its real estate documents, the work being done by typewriting machines. The liability to error is, of course, great, even though several checks are devised to secure accuracy. It seems that photography has enormous advantages in this work. That it has not been extensively used is probably due only to the objection that bureau chiefs have to any reform that may reduce the number of members of the office force, who are useful as political workers. This is, however, not a principle that should weigh with those who are interested in securing efficient administration of public affairs.

The practical problems in the photographic recording of documents are principally the form of the camera and the durability of the impression and paper. All these problems are now solved in a most satisfactory manner. Paper stock of high quality is easily obtained. The ordinary stock, such as is used in newspapers and cheap books, is wholly unsuitable. Copies of newspapers, a few years old, preserved in our libraries, are now falling to pieces, the bulk of the stock being ground wood. Given a good paper, the preservation of the impression is not difficult. The silver print on bromide paper, the blue print and the gum bichromate are all permanent. The bromide print has been extensively employed for transcription of records for immediate use. Many libraries that have valuable files of journals, patent office records and similar works that the managers of the library do not like to loan are made available in the most satisfactory manner by means of the photostat. The print

thus obtained is durable. The blue print is also permanent. Little attention has been paid to the application of the gum bichromate to this work. The print it yields should be permanent, for it depends on carbon, which is unalterable in the air. It seems possible to devise comparatively simple methods by which the sensitive sheets can be prepared in convenient form, keeping their sensitiveness for a reasonable time. For the routine work in such an office as that of Recorder of Deeds, very simple apparatus would be needed. As the papers to be copied are almost always of the same size and similar in text, a few lenses set in a partition, back of which only non-actinic light is allowed, would constitute the cameras. The sheets would be placed at an invariable distance from the lens, and thus no focusing will be required. The holders of the glass plate or film will be simple slotted frames, at a fixed distance back of the lens. As very rapid exposure is not required, an emulsion safe in yellow light can be used with tank development. The papers to be copied will be illuminated by a powerful incandescent light of uniform intensity. After the proper exposure, the plates are placed in frames holding a dozen or more, immersed in the developer for the proper time, then fixed, washed and allowed to dry, all these operations being carried out while the plates are in the frames. These frames should be made of metal, or of wood so impregnated as to absorb none of the



Provided always, nevertheless, that if the said Mortgagor his Heirs, Executors, Administrators or Assigns, do and shall well and truly pay, or cause to be paid, unto the said Mortgagee, its Successors or Assigns, the aforesaid debt or principal sum of One thousand Dollars, together with interest thereon, and together with the fines and the monthly premium aforesaid, on the days and times hereinbefore mentioned and appointed for payment of the same; and shall also well and truly pay, or cause to be paid, to the said Mortgagee, its Successors or Assigns, the above mentioned sum of Ten Dollars, on the first day of every month, as and for the contribution on the said One Share of Stock as above mentioned; and shall on or before the first day of October of each and every year, deliver to the said Mortgagee, its Successors or Assigns, receipts for all taxes of the current year assessed upon the Mortgaged premises, according to the condition of the said above recited Obligation without any fraud or further delay, and without any deduction, defalcation or abatement, to be made of any thing, for or in respect of any taxes, charges or assessments whatsoever, that then, and from thenceforth, as well this present **Indenture**, and the Estate hereby granted, as the said above recited Obligation shall cease, determine, and become void, any thing hereinbefore contained to the contrary thereof, in any wise notwithstanding. **Provided further**, in case of default in the payment of the principal, interest or fines and the monthly premium as aforesaid, or any part thereof, or in default of the payment of the monthly contribution on the said One Share of Stock, as above particularly recited and mentioned, or any part thereof, for the space of Six months after any payment thereof shall fall due, or in such delivery to the said Mortgagee, its Successors or Assigns, on or before the first day of October of each and every year, of such receipts for such taxes of the current year assessed upon the mortgaged premises, or if the said Mortgagor shall not well and truly pay, or cause to be paid, the

and taxes, on the above described premises, when the same shall become due and payable, and also shall not well and truly pay, or cause to be paid, all and every such sum or sums as shall hereafter be assessed by any public authority upon the said principal debt or sum, or upon the interest thereof, then and in such case the whole principal debt aforesaid shall immediately thereupon become due, payable and recoverable; and it shall and may be lawful for the said Mortgagee, its Successors or Assigns, to sue out forthwith a Writ of Scire Facias upon this present Indenture of Mortgage, and to proceed at once thereon to recover the principal money hereby secured, and all interest, and all fines and all monthly premiums thereon, as well as any contribution on said Share of Stock then due, according to law, without further stay, any law or usage to the contrary notwithstanding. And it is hereby agreed, that in case the same or any part thereof has to be collected by process of law, that an attorney's fee of 5 per cent. shall be added to and collected as a part of the costs of such proceedings. And the said Mortgagor for his Heirs, Executors, Administrators and Assigns, hereby waive and relinquish unto the said Mortgagee, its Successors and Assigns, all benefit that may accrue to him by virtue of any and every law made or to be made to exempt the said above described premises, or any other property whatever from levy and sale under execution, or any part of the proceeds arising from the sale thereof, from the payment of the moneys hereby secured, or any part thereof.

In Witness Whereof, the said Parties to these Presents have hereunto interchangeably set their hands and seals. Dated the day and year first above written.

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John Doe

solutions. To secure the subsequent identification of the copies, each document, on its reception, should have a serial number, which should be repeated on each page. No difficulty would then be found in the placing together the proper copies.

This procedure contemplates the production of a negative of each page of the document, and it may be objected that such is an unnecessary expense, as duplications in any number can be obtained by methods now in vogue. This is a matter which deserves further consideration, but the plan just outlined is also applicable to making duplicated prints on paper.

An advantage of the photographic method is the saving of space. It is possible to reduce the copy much below the size of the original without sacrificing seriously the legibility. Legal documents are often much more bulky than needed, and copies one-quarter of the size are entirely satisfactory and save much space. It may be a question whether the preservation of newspapers may not be made by this method. Not only are these papers, as noted above, likely to go to pieces in a few years, but their bulk is becoming a most serious problem with librarians. Their pages reduced to quarter size on good quality, very thin paper, will be a saving of space that all will appreciate. As an illustration of the manner in which a legal document can be reduced, a portion of a copy from a sheet about 10 x 12 is appended. One great advantage of photographic method is that the signatures are preserved in exact form, while in the common transcription method this important item of identification is lost.

COMBINATION OF DESENSITIZER AND DEVELOPER

EDMOND PIFRE presents in *Photo-Revue* a series of suggestions for improvement of developers. Among these is a combined developer and desensitizer. Advantage is taken of the effect of picric acid. Lumière and Seyewetz, in their extended studies of the desensitization (see PHOTOGRAPHIC JOURNAL OF AMERICA for July, 1921), noted the action of picric acid, but stated that it is more of a screen effect than a true action on the sensitiveness of the emulsion. Pifre, however, finds the following solution (No. 1) satisfactory:

1% solution of picric acid in water	100	c. c.
Sodium bisulphite solution	50	c. c.
Amidol	0.5	gram
10% potassium bromide	15	drops

The plate is to be immersed in this bath in a safe light, but after a minute a strong yellow light may be used, just as in the employment of other desensitizers. The source of light should give a direct beam, and not a mere diffused effect. The developer is a little slow, compared to the standard neutral solution, but seems to gain rather than lose activity. A red tint is

produced, due to the formation of a picramate by reaction with some of the sodium of the sulphite. This tint, of course, adds to the protecting effect. As picric acid is a familiar substance, easily obtained, there is a convenience in its use which does not exist with the rarer substances.

Pifre also claims that picric acid gives a great power for control of over-exposure. For this purpose he employs the following solution (No. 2):

1% solution of picric acid	100 c. c.
Sodium bisulphite solution	5 c. c.
Sodium sulphite (dry)	3 grams
Amidol	1 gram
10% potassium bromide solution	10 c. c.

This developer will correct over-exposure of as much as 15 times, and on slow paper will still give fair results with even 20 times the normal exposure. The convenience of the process will be increased by preparing the following stock solution (No. 3):

Water	1000 c. c.
Picric acid	10 grams
Sodium bisulphite solution	50 c. c.
Potassium bromide	10 grams

When used 100 c. c. should be mixed with 3 grams of sodium sulphite (dry) and 1 gram of amidol. Perhaps the sulphite could be introduced into the stock solution, but the author has not tried this plan.

Boric acid was tried as a substitute for picric, using 4 per cent., but while some control of over-exposure was obtained, it was not as great as with the picric acid. These experiments led to investigations of the method that has been much exploited with amidol, namely, the use of two baths. In this method amidol ranks superior to pyro, especially as the so-called "hard" bath may be used in a series of developments, which cannot be done with pyro. Owing to the fact that the bath is in this case concentrated and somewhat acid, it keeps for some time, and the "soft" bath is also more lasting than pyro would be. After pointing out the principles upon which the soft bath should be based, Pifre gives the following formula (No. 4):

Water	360 c. c.
Sodium sulphite (dry)	5 grams
Sodium bisulphite solution	1 c. c.
Amidol	0.5 gram
Potassium bromide, 10% solution	10 drops

This solution is divided into three equal parts. Each of these portions must be utilized only for a 5 x 7 plate, so that each of a set of three plates will have the advantage of a fresh solution. In case of great under-exposure, a plate may be passed successively through the three baths to secure development of detail. Indeed, this bath will in many cases, be the only one needed. The hard bath will be required in two cases: (1) correction of over-exposure which is indicated by the rapid appearance of the details, and (2) the neces-

sity of giving contrast in a view primarily flat, such as a landscape in shadow or covered with mist. Experience has shown that the hard bath should be made strictly to the formula. Thus, if in formula No. 2 the picric acid and bisulphite are omitted, the large amount of bromide which is directed will not control an exposure of over 5 times the normal, if the plate is immersed at once. The small effect that has been obtained in the soft bath, even though pushed somewhat beyond the time when over-exposure has been indicated, will not be remedied in the hard bath.

By these manipulations the operator has always the power to equalize contrasts, keeping the plate, for instance, in the soft bath until it is satisfactory; if removed to the hard bath it can be withdrawn as soon as the proper contrasts are obtained, but this point must not be passed, as there will be no possibility of recall. Experienced users of this method regard the best indication of completion of the development to be when the clear parts of the plate are slightly dimmer than the border of it, which has been protected from the light by the frame. Pifre affirms this for plates correctly exposed or but slightly over-exposed, but in case of marked over-exposure, it is necessary to transfer the plate to the hard bath as soon as evidence of such over-exposure is shown. It is a good plan for beginners to note the number of seconds required for the image to be clearly evident when the exposure with a given plate is correct. If, in a given development, a shorter period is required, the plate should be promptly transferred to the hard bath. It is evident that the soft bath ought to act quite slowly in order to observe the progress of development—the degree of dilution given above secures this effect. Once the ability of determining the proper point of development is acquird, the procedure will be found to be very satisfactory, though it has the drawback that it requires the making up of solutions when they are to be used.

FIGURES IN THE LANDSCAPE

IT IS much to be regretted that so many hindrances contend with the endeavor of the photographer to complete the landscape by introduction of figures of people who manifest interest in the subject depicted. Painters in the early period of the nineteenth century introduced figures and animals in their compositions, which added much to the interest of the subject.

Turner is very partial to their use, and he exhibits great taste in their disposal.

It is true that in many instantaneous views of assemblies or in occasional street groups, in market places, along wharves or on the seacoast, the natural grouping is frequently full of life interest, but withal there is often an unfortunate intrusion which spoils the whole effect and it is almost impossible to get rid of the undesirable feature by any method of elimination.

The photographer has his best opportunity for selection and elimination in rural scenes, about farm houses and cottages along country roads, where there

is such a variety of characteristic life so in sympathy with the subject. Children and domestic animals may be managed to good service in a variety of ways, if properly treated, but they (the children) should never be enlightened as to your intentions or their parents will insist on dressing them up in their best.

Sheep have ever been in favor with the painter, not that individually a sheep looks well in a picture, rather the contrary, but when in groups, as the painter invariably introduces them, they form a fine mass of light in the foreground, and, when driven, the dust they raise gives a softening to the atmosphere, which is an added feature.

It is these happy accidents which give quality worth more, as a rule, pictorially, than what is studied for effect, for it is a most difficult matter in the introduction of figures of any kind to avoid the look of studied pose which detracts from the spontaneity of the picture. Groups in the harvest field furnish opportunity for good pictures. Corn huskings are also fine subjects.

Now it may be well to give a few practical hints for placing figures so as to make them seem initial parts of the scene. In the first place, you must have a feeling for perspective. Unless the figure is properly placed, even if it does conform in size to the requirements of perspective, you discover, despite your pains, that somehow or other it does not look right. Now this is due solely to the position of the figure relative to the horizon of the scene.

Take any person in a position against the horizon at a distance, say, thirty feet from the camera, with that instrument at the height at which the average photographer, standing erect, observes, on the ground glass, the horizon appears to cut across the shoulders of the figure. Now lower the camera so that the photographer has to kneel to look on the ground-glass, and you note that the horizon cuts the figure about the waist line. The vertical reduction is proportionate throughout the landscape. For example, the spaces from the figure to some object beyond, a fence, say, or a hedge somewhat back, and these are likewise all reduced proportionally.

Where the horizon bisects the shoulders, as in the first example, the figure looks much smaller relatively than when the horizon strikes the small of the back.

Of course, this implies that the figures are on level ground, but where the ground descends a little, the horizon will come up higher. In fact, a little rise or fall of the ground will make so much difference in the relative position of the figure's head and the horizon that it is impossible to give any fixed rule about it, and it is left to the intuition of the artist, who estimates the right position.

Artists used to take greater liberties in the introduction of figures in landscape than they do now, but photographers are apt to judge unfairly, because our eye is so used to lens perspective. On the whole, photography has been a brake upon this license and a benefit to art, but how often the pictorial photographer has wished he could exaggerate like the painter when he is disappointed at those beautiful distant hills coming out so dwarfed and with little of the grandeur they showed to his vision.

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False Perspective

A charming photograph of a landscape is shown to the painter. We wait in expectation of plaudits for our artistic expression of the natural scene. Credit we do get for composition of line and good distribution of the masses of light and shade, but, at the same time, we are told that it "falsifies distance"; in other words, the planes of the picture are not in harmonious relation. As a rule, photography is topographically true, but the artist critic is not always captious.

The great feature of artistic photography is in its marvelous accuracy in delineation of form. The highest art can hardly rival it here, and the unbiased painter is willing to make use of the camera with hearty acknowledgment of its value in this particular, but he is fair when he points out its artistic shortcomings.

We cannot blame the lens because from its point of view it is geometrically true, and it is not its fault that its perception is not in accord with what our vision receives, because our perception is conditioned materially by our mental judgment of things and their relations.

The mind instinctively apportions the objects which lie in planes nearer the principal objects of contemplation, to the distance the principal objects occupy, and hence intervening objects do not seem, as they really are, optically projected on the retina.

For instance, when we look at a distant prospect through the intervening trunks of two massive trees almost in the immediate foreground, mentally we fail to consider the actual size and dimensions of these giants of the forest, but relegate them to their artistic relation to the entire scene. Now the painter is right in following the avouch of his artistic vision. He tries in his reproduction of the original to give the conception as it mentally appeals to him, to give to the spectator as much as possible of the same effect.

The mind plays tricks with our vision by presenting an illusion, betraying us into a firm belief that we are seeing depth and distance, looking through great stretches of space, when logically we know the utter impossibility.

This peculiarity of mental vision must constantly be kept in mind by the photo-pictorialist and he must make allowance for the exaggeration by management of detail.

Portraits Painted and Portraits Photographed

Occasionally, one sees a head, a photograph merely, taken from life, which is so closely akin in its pose and treatment of light and shadow to fine engravings from portrait paintings by Reynolds, Raeburn, Stewart, Whistler, and others equally eminent, that one is astonished at the similarity. But you will say, "See the amount of commonplace work produced by portrait photographers."

Did not the most eminent portrait painters have to turn out many a work that was no picture? Mere pot-boilers! And think of the hundreds of portraits painted by men of no ability who were working contemporaneously with the world's greatest portrait painters and whose productions, which doubtless had merit and pleased those for whom they were painted and have passed into oblivion. Photographic portraitists forget this when they are striving after a high ideal. We all cannot produce the grandest work; some few must alone be par excellent. The great majority must be satisfied with producing pleasing work, the same as the ordinary artist in portraiture.

When a noble head, properly posed and lighted, is rendered, with all its dignity, in exquisite refinement of light and shade, is it any the less a work of art because a lens was used instead of a brush? The technical excellence is the mechanical element, and though it may require the exercise of more skill and labor in the acquisition of power to wield the brush or pencil, the acquisition is, after all, only the triumph of mechanical dexterity. The thought, the feeling, the expression are subject elements in both methods, and dependent upon the

temperament of the individual. But this argument has been disputed time out of mind without either contestant coming to an agreement. Yet I often think what would Raphael, or Michael Angelo, or Leonardo da Vinci have said, after laboring for hours to reproduce in sketch with the so-called silver point, could they have been shown some of the magnificent heads now exhibited by our photographers of the advanced school, the result of the artistic individual factor in securing the fine model for reproduction and the knowledge, taste and sentiment in the posing and illumination in the selection of background and harmonious accessories.

Restoring and Copying Daguerreotypes

The Daguerreotype, although it is probably the most beautiful form of reproduction ever done by the agency of light, is now entirely superseded. It has the advantage over most other methods of photographic reproductions of being the direct impression, so that nothing is lost as in ordinary negative work. It is no wonder, then, that these beautiful relics of an extinct art should be treasured and when time has shown his impress, that the possessor should inquire for some means of restoring them to their pristine beauty. Besides, as these pictures are of our revered ancestors, there is also a laudable desire to have copies made from the originals.

Indeed, quite a remunerative trade is done in large cities by experts in this line of work—the restoration and copying of deguerreotypes and ambrotypes.

It argues well for the permanency of the daguerreotype that there are so many still in a good state of preservation. But if the image has not been properly protected from the action of air, it is liable to become tarnished by time. Seventy-five years is a good life for most things, and it is a marvel that daguerreotypes should show so little deterioration. I am afraid the best of our modern processes will not be able to undergo a like ordeal.

The usual mishap to the daguerreotype is tarnish to the surface. Sometimes, in extreme cases, the entire surface is darkened so that the image is scarcely visible. But when the tarnish is removed, the picture is found to be as bright-looking as the day it was made. If only the edges of the picture tarnished, we do not advise removal of defect unless a copy is desired, when the whole surface must be cleaned. We say this because while the risk of injury is slight if care is exercised in the manipulation, the preciousness in which such things are held makes one pause.

First of all—carefully remove the silver plate from its sealing and observe never to touch the surface with the fingers. If there is any dust, gently remove it with a soft camel's-hair pencil. (Do not use your plate duster.)

To remove the tarnish: Place a small piece of potassium cyanide (deadly poison, remember), about the size of a pea, in an ounce of distilled water.

Take the plate by the upper corner with a pair of pliers and rinse it well under a thin gentle stream of water. Then pour over it some of the cyanide solution, and return to the glass; repeat this several times, until the discoloration is removed. If you find, however, no effect, increase slightly the strength of the cyanide solution. Wash well under the tap again and then hold the plate over a spirit lamp flame, applying the heat at the top of the plate first, so that the heat will drive the water downward. Incline the plate a little for this purpose.

The drying demands care. The plate must not be held too long over the flame. When dry, a copy may be made, and then be careful to replace the plate in the mounting, and seal up and put in the case—as you found it.

Some photographers disregard this, but it is dishonest practice, as it subjects the image to hostile influence of the air.

Testing Paper-Stock

One of the most serious deteriorations in manufactured articles is that of paper-stock. Originally paper was made from cotton and linen rags and was strong and durable. The introduction of wood-pulp caused some deterioration of the commercial stock, but it was still a pulp, and the paper made from it had, at least, moderate durability. The introduction of ground wood has flooded the market with a type of paper that scarcely lasts long enough to get through printing press. Hans Zaepernick, in *Das Atelier*, presents some points as to the qualities required by photographic paper. It should not suffer any color change by exposure to light and air. It must contain nothing that can affect the sensitive material. It should not be liable to appreciable expansion or contraction under the several treatments to which it must be subjected in preparation and use.

These qualities are inherent in the rag stock of the older processes, but the increase of prices in such grades has led to the use of inferior materials. This increase has been world-wide, due, of course, to several causes, such as increased cost of labor, interruption of free importation by reason of blockades, and excessive use of paper, owing to the extension of advertising of all types and the introduction of the huge Sunday supplements.

Inspection of paper samples is not a safe guide to the detection of some of the important impurities and adulterations, and chemical and microscopical methods must be employed. One of the most objectionable additions is ground wood. This is simply finely divided, raw wood, ground on a wheel. It has no felting quality, but must be incorporated with a certain amount of true pulp. As it is much cheaper than pulp, there is, of course, a strong temptation to use as little of the latter as serves to make a stock that will bear printing and brief handling. What becomes of the material after it leaves the hands of the printer or other user is not his concern. Hence, our common newspapers become soon yellow and friable. It is possible to detect an admixture of such material by exposing a specimen so that a part is completely protected from the light and the other exposed, but some time is required for an appreciable effect. The specimen, as noted above, also becomes brittle, so that it cannot be folded without breaking. Pure rag-stock will not undergo such changes. Chemical tests are available which permit of very prompt detection of raw wood stock. These tests depend upon reactions with some of the substances that are associated with the cellulose that constitutes the true and valuable pulp material, which substances are removed in the chemical processes employed in the making of true pulp. A solution of 5% of anilin sulphate in water will produce promptly a yellow stain on a sample that contains ground wood. Some more complicated organic substances are rather more satisfactory. Thus, a solution of 5% of phloroglucol in water is mixed with an equal volume of strong hydrochloric acid. It is advisable to make up only a small volume, a few cubic centimeters of this solution, as it does not keep very well, especially when exposed to light. When ground wood is present in a sample a red stain is produced, the depth of which has some relation to the proportion of adulteration. For the distinction of different kinds of true pulp a solution of zinc chloride and potassium iodide with a small amount of iodine is employed. The materials are dissolved in water. The use of this solution, however, is mainly in association with microscopic examination, which need not be discussed here. Metallic particles may find their way into paper and bring about objectionable reactions with the sensitive coatings. For the detection of these it is recommended to soak a small amount of the sample in rather strong vinegar, and after a moderate time remove the sample and allow it to dry without washing out the acid. The dry mass is immersed in a dilute solution potassium ferrocyanide (the yellow, not the red salt) when the presence of iron particles in the sample will be shown by the formation of a blue stain, and of copper by a brown stain.

The Enlarged Picture

The perfection in media intended for enlarging from a small negative make this mode of presenting the picture most popular and deservingly so. The enlargement, as a rule, is the form of most exhibition pictures, because in such shape the attractive features are best displayed, and besides the method affords opportunity for modification and better expression of the artistic personal equation.

In the ordinary direct print most people of normal vision find it inconvenient, if not troublesome, to view a picture nearer than twelve inches. As most small size pictures are made with average focus of five or six inches, this distance does not give proper view. The photograph taken with a twelve-inch lens would be needed. But such a picture necessitates the employment of large camera and a large plate. Short focus, small size photographs must be viewed close-up, to do them justice, but if this small picture, taken with a short focus lens, be enlarged, we have a view put at a convenient distance, which still presents the same angle of view as in nature.

Another advantage is the greater definition obtainable in the foreground than is had by a direct view with a long focus. Another advantage is the chance of correcting distortion of the original, if such is manifest, by manipulation during the process of enlarging, by increasing the distance between the diaphragm and the lens.

Raydex Three-Color Printing

To anyone who has not himself experimented with three-color photography the process described in detail appears intricate and full of difficulties, but in actual practice these intricacies and obstacles disappear, and, given reasonable care, once the original negatives are made the procedure is as simple as any other. No special apparatus is needed except that the camera must be adapted for plates, that the slides move easily in their guides, and above all that the apparatus is steady and firm, for the slightest movement during the taking of the three negatives is fatal to success. In addition to the camera, three-color filters—red, green and blue—are required, and it is most advisable to procure a set of these from the start, as such a set is tested before leaving the factory to fulfill the following requirements:—

(1) Give the same sized image.

(2) Be of identical thickness. These filters are made of suitably dyed gelatine films, and may be used either unprotected or cemented between glass; if the bare films be employed they may be placed in front of the lens, taking care not to damage them by finger marks—to which the film is very susceptible. If they are cemented between glass the latter must be of the very finest quality and optically worked to enable them to be used in front of the lens; if used behind, thin plate glass will suffice. In the third alternative position—*i. e.*, placed immediately in front of the plates, as in a repeating back—the quality of the glass is immaterial.

In outline the process is as follows:—

(1) Three negatives are made, each through one of the filters referred to.

(2) Three bromide prints from these are made.

(3) Three-color positives are made from the bromides on yellow, red, and blue tissue, and subsequently by means of transparent supports superimposed in exact register on a final paper base.

We will take first the making of the negatives. It is best to experiment with still life subjects which can be taken indoors, thus doing away with any difficulties arising from movement due to wind—flowers, fruit or butterflies make admirable trial subjects, the more brightly and sharply defined the colors the better, as this makes the process the easier to follow. The trouble concerning wind in outdoor work to which I have referred is, of course, the waving of branches, trees, etc.; in an ordinary monochrome reproduction this is irritating, but it is even more so in three-color work, as it will give rise to color fringes.

A method of obviating this is to practice counting seconds and half seconds without reference to a watch—being thus enabled to keep an eye on the subject while the exposure is being made, as soon as a breeze springs up and movement seems imminent the shutter may be closed and reopened when all is still again. The moment of opening should be reckoned as 0—not 1—and if it is found necessary to close the shutter when, say, 3 has been counted the time of re-opening should be the same as that counted on closing.

We will suppose that it has been decided to make the first attempt on a butterfly. Having pinned the subject on the easel and sharply focussed, the next step is to ascertain the correct exposure by the aid of a meter. A very full exposure is necessary, two or even four times that indicated by the reading being not excessive. We will suppose that using $f/8$, the meter indicates ¼ sec., and we decide to give a normal exposure of 1 sec. The next step is to find out the multiplying factors for the filters in use. Presuming we are using Wratten tri-color filters and Wratten Panchromatic plates we shall find the necessary factors on the card accompanying the latter—we will say that these factors are:—Red 7, green 10, blue 6, then we shall have to give 7 secs., 10 secs., and 6 secs. respectively. (By the way, it is always advisable to number the plates 1, 2, and 3 when filling the slides, and always to work in the same order, red, green, blue or blue, green, red, to obviate any subsequent difficulty in identifying the negatives.) Backed plates should always be used. Inserting the red filter in the holder, the negative numbered 1 is exposed for 7 secs.; reversing or changing the slide, as the case may be, and altering the filter to green; No. 2 is exposed for 10 secs., and finally, No. 3 is exposed through the blue filter for 6 secs. Care must be taken in using the filters to see that they are always placed in position the same way; there are small labels on each Wratten filter, and by means of the lettering on these this is quite easy of accomplishment. Another point is that great care must be taken not to jar or move the camera in any way while removing old or inserting new slides.

Having given the plates identical relative exposures the next procedure is to give them identical development—in fact, from this stage, whether we are dealing with plates, bromide prints, or color positives all must have exactly the same treatment to ensure uniformity of the final result. To this end, then, we develop the three plates side by side in a dish, or better still, in a tank, and thus escape the temptation to lift any one of them from the developer for inspection, which would be liable to impair the uniformity of development. Having fixed, washed and dried the negatives, we are ready for the next step, which is to make the bromide prints.

The paper employed for this purpose should be cut off from a roll, each piece in the same direction of the grain to secure equal expansion during the subsequent treatment. The Raydex Co. supply bromide paper in rolls for this purpose in two grades, fast and slow. We now cut off four from the roll, one for each of the negatives and a smaller piece for use as a trial exposure; providing the negatives have been correctly exposed the time required to obtain a good print from the green negative is the correct exposure for all three. Having marked each piece of paper R, G and B, in pencil on the back to correspond with their respective negatives, we proceed with the printing; they should preferably be printed side by side simultaneously, but if the size of the negatives or the limitations of the source of light prohibit this they may be printed in succession, taking care that identical exposures be given and that the intensity of the light is stable. They are then soaked in cold water for a little while and developed together in the same dish with amidol or M.Q.—developing them right out as would be necessary for subsequent sulphide toning or the Carbro process.

Having thoroughly fixed and washed the prints, the next stage—the making of the color positives—may be proceeded with, or the prints may be dried and operations continued at a later date; from now onwards all the operations may be performed in daylight.

For the third stage, the making of the color positives, the following articles are necessary:—

Three transparent celluloid supports.

Three pieces of pigmented tissue or "color sheets," yellow, red and blue, cut slightly larger than the bromide prints in use.

Two dishes, one preferably large and deep.

Sensitizing solution. Waxing solution. Flat squeegee.

About half an hour before they are needed the three transparent supports are waxed by pouring a few drops of the waxing solution on a clean, soft rag and rubbing it lightly over the support. If there is an excess it should be polished off with a clean rag, taking care to leave no streaks; but it is essential that the whole surface be covered, else there will subsequently be difficulties in stripping the final paper support.

If the bromide prints have been dried they must be soaked in water until limp and then placed on clean glass supports, *e.g.*, clean negative glasses.

Now fill the larger dish with clean, cold water and immerse the three-color sheets until limp—they will soon uncurl, and should remain in the water for two or three minutes—longer in hot weather—after which they are hung up to drain. Now proceed to measure out the sensitizing solution, which is done by taking 1 dram of Raydex No. 1 and No. 2 solutions and making up with water to 1 ounce. The preparation of this solution should be left till the last moment, as chemical action between them starts at once. It will be found that one ounce is sufficient to sensitize three ½ pl. sheets, but care must be taken to avoid air-bells. In dealing with the color sheets as in the case of the negatives, each must have identical treatment, and the operations should be carried through in the order in which they have been commenced, say, red, green, blue.

Now take the yellow color sheet and immerse it in the solution, dispelling any air-bells, when it may be followed by the red, and lastly the blue; the duration of this bath is two minutes, during which time the dish must be rocked and the sheets continually moved. At the end of this period remove the yellow color sheet with the left hand, and with the right take up the bromide print from the blue negative with its glass support, immerse both under water, and quickly slide the color sheet on top of the bromide, holding them firmly so that there is no slipping, as chemical action takes place at once, and any movement would give rise to a double image. Remove them instantly, taking care that the surplus solution falls into a sink or other receptacle and not into the water, as, even in a weak state, it will work havoc with the succeeding bromides; squeegee them firmly

together, again avoiding any slipping or movement, and then treat the "green" bromide with the red color sheet, and, lastly, the "red" bromide with the blue. Now remove them from their glass supports, yellow, red, and then blue, and place them between blotting paper under a flat weight for about twenty minutes, when the action will be complete. It is recommended to practice applying the color sheets to the bromides with two pieces of paper until dexterity and confidence are attained, as there must be no fumbling at this stage; subsequently, everything is plain sailing. The sheets should be applied as quickly as possible, otherwise loss of detail in the high-lights is liable to ensue.

When the twenty minutes has expired, place one of the waxed transparent supports on a level surface—a piece of plate-glass is excellent—and taking the yellow color sheet with its bromide, gently strip the two apart, placing the latter in a dish of clean water; immerse the color sheet in another dish of clean water for a few seconds, then drain and place upon the support; squeegee in all directions, and then place a piece of dry blotting paper on the back of the color sheet and squeegee thoroughly to remove all moisture, or subsequent frilling may occur. Repeat this performance with the red and the blue sheets. After a thorough washing, the bromide prints may be re-developed and used again.

"Development" can be proceeded with immediately. This consisting of placing the supports in water at a temperature of 115 deg. F. After a minute or so the backing may easily be removed, and, having served its purpose, is thrown away, when the supports will be seen to be covered with a thick coating of pigment. To remove the superfluity of this they are moved about face downwards under water, holding them vertically at times to allow the pigment to drain away, but do not always drain in the same direction. At the conclusion of this stage the celluloids may be very gently mopped with a camel hair brush to remove any loose particles of pigment; they are then placed in cold water for a few minutes and set aside to dry. I have usually found it advisable to develop the yellow positive by itself, as otherwise particles of the yellow pigment adhere to the red and blue.

We now have three color positives on celluloid supports, and it only remains to combine them on a final paper support—I am for the present dealing only with single transfer. Take a piece of transfer paper, soak it in clean cold water for about half an hour, then immerse the yellow color positive and bring them into contact underneath the water, place them on a flat surface, gently squeegee, and set aside to dry, when, by slightly bending the celluloid, the transfer paper will leave the support, carrying with it the yellow print. Now moisten a soft cloth with petrol and gently rub the surface to remove the wax, finishing off with a clean cloth. Repeat this operation two or three times to make sure that the wax is removed, otherwise it may be difficult to strip from the next support, and then soak in water for a few minutes with the red positive. Remove them in contact, and quickly move the print about until it is in exact register with the red color positive; then squeegee carefully so as not to disturb the registration, and put aside to dry, when the paper will leave the support carrying the yellow and red prints combined. Remembering to clean the wax off carefully with petrol, the same operation is repeated with the blue color positive, and, when dry, the picture is complete. It will then have a highly glazed surface, which may be removed if desired by cleaning with petrol, followed by a short soaking.

The single transfer process necessarily gives a picture which is reversed. In some cases this is quite immaterial, *e. g.*, in flower studies, etc.; but when reversal is undesirable, the double transfer process must be used. Personally, in all cases I much prefer it to the single.

In this case a piece of temporary paper support is soaked in water for ten minutes, and then applied to the color positives in precisely the same manner as in the single transfer process, only it is obvious that now the order of assembling must be reversed, *i. e.*, blue first and yellow last. When the three color positives have been registered on the temporary paper support the latter is treated with petrol to remove the wax, and then soaked in water for two or three minutes together with a piece of final support a little larger than the size of the picture—the Raydex Company supply the latter, or any of the smoother Autotype papers are excellent. Remove them in contact, squeegee, and then place between blotting paper for about five minutes. At the end of that time place them in water at a temperature of 120 deg. F. with the final support uppermost. The latter should be kept dry. After two or three

minutes, turn them over so that the temporary support is uppermost, and submerge them under water, when the temporary support may be carefully stripped off, leaving the picture on the final support. Having consideration for the fact that three negatives are required and the present cost of plates, it is satisfactory to know that whole-plate prints may easily be made from small negatives by making enlarged bromides in place of contact prints; the exposures, of course, must all be accurately timed and all identical.

The process may appear very lengthy, but in reality it is not so. I have frequently made a color print in a morning. Moderate heat may be employed to dry the color positives on their transparent supports and in their various stages, and this hastens the proceedings. Having made the negatives, the remainder of the process should be an ideal one for the winter evenings.—H. J. Campbell, *in the British Journal of Photography.*

Camera Maps

It is said that among the most accurate of maps are those made with the camera. Engineers in the Government employ have, it is reported, completed a survey from which maps have been made of several thousand square miles in Alaska. More than thirty thousand square miles on the boundary line between the United States and Canada have also been mapped with the camera.

With the rapid development of the airplane and the dirigible balloon in European countries came corresponding development of aerial photography for military purposes and a new awakening to the real value of aerial photography for surveys other than those of a military character. French engineers have indorsed the aerial methods of photographic surveying as both rapid and economical.

An apt illustration of this fact is found in the survey and resulting map of Prince William Sound, Alaska. Here the mountains rise from two thousand to ten thousand feet above the water's edge. Two cameras placed in a forty-foot motor boat were used by Government engineers in making a survey of 2,000 square miles of territory. The boat was run 220 miles and 220 pairs of pictures were taken during the cruise, which lasted fifty-eight hours. From these pictures an accurate map of the region has been made. To have made the survey and map under former methods would have required months of difficult and expensive travel on the part of the engineers.

It is not commonly realized that a photograph of a plane surface taken with a plate camera directed perpendicularly toward that plane is a map of the area which the photograph embraces. In other words, it is possible to use the camera to produce charts, in the form of negatives, of level ground, provided the camera can be placed in a position directly above the ground. Here the camera will merely be doing on a small scale what is done on a much larger scale in map reduction by photography.

Engineers use the panoramic camera in making surveys of mountainous regions and for aerial flying positions. The camera is set up on the side of the mountain, overlooking a considerable section of surrounding country, possibly several square miles in total area. The maps are made from the panoramic photographs. It having been decided at what altitude the photos were taken, it is comparatively an easy matter to determine the altitude of various points in the pictures.

The panoramic camera consists of a box made of aluminum, inclosed in a protecting frame of mahogany, and this is lined with felt. The top of the box is the reference plane for leveling and the vertical axis carrying the lens is placed perpendicular to this plane. The circular film guides are adjusted so that when the film is in position for exposure all elements will be perpendicular to the level plane and hence parallel to the lens shaft.

The panoramic camera used in making maps is of two types, one employing a five-inch film cartridge and the other a six-inch cartridge. Two films are carried in each machine, and after one has been "shot" the camera is swung around and the other film exposed. The camera is held in a perfectly level position by means of wire guys.

That the camera presents an accurate means of making maps is well illustrated by the fact that in the recent Alaskan surveys, Government experts discovered by checking up their cumulative error in vertical angulation, that the error amounted to but twenty-five feet in one hundred miles. In a late survey the error in 250 miles was but sixty feet, and as this was stretched over some one hundred stations the average error was less than one foot for each station.

Photographing Blue Prints

From Eastman Kodak Research Laboratory, Report No. 998.

In view of the difficulty of photographing blue prints on ordinary plates attempts were made to change the Prussian blue to some other substances of a less actinic color. Of the various methods tried two of those recommended by Brown (ferric and heliographic processes) gave the most satisfactory results. The methods are as follows:

TANNIN PROCESS

The dry print was immersed in the following solution:

Ammonia (.897)	12.5 c.c.
Water to	1 liter.

As soon as the blue disappeared the print was rinsed for a few minutes and immersed in a 2 per cent solution of tannic acid. When fully developed the print was thoroughly washed.

SILVER PROCESS

The well-washed print was rinsed in distilled water and bleached in the following, in yellow light:

Silver nitrate	20 grams
Distilled water	1 liter.

After washing in distilled water the print was fumed with ammonia, exposed to light and developed with a ferrous oxalate developer and washed thoroughly.

Toning by the Method of Bleaching, Partly Developing and Sulphiding

From Eastman Kodak Research Laboratory, Report No. 1346.

There appeared in the *Professional Photographer* for March 16, 1921, an article entitled "Controlled Tones on Kodura." The method consists in: (1) bleaching an ordinarily prepared black and white print in a ferricyanide-bromide bleach; (2) washing to remove the yellow stain; (3) developing with a normal developer, fifteen times diluted, not further than up to the point at which the image shows a faint purplish tinge: (4) sulphiding; and (5) washing. It is emphasized that bleaching and redeveloping should be carried out in artifical white light, and in the case of a large batch of prints, the interposition of a stop bath of one part of acetic acid to 80 parts of water followed by a few minutes' washing is recommended.

This is obviously a mixed toning method, the image finally obtained consisting of a mixture, in an indefinite but controllable ratio, of finely divided silver (colored in consequence of incompleteness of development) and the silver sulphide. The chemistry of the method is sound and the results should be permanent and free from "double toning." Some experiments have now been made on the use of this method for toning Artura and Velox.

Influence of light during toning. Variation in the illumination at any stage up to and including the partial development was found to produce, in general, a variation in the velocity of the partial development. Approximately constant illumination such as by means of the artificial lights of the room, is therefore desirable.

Developer. Any ordinary developer may be used, provided that it is diluted sufficiently and that an adequate volume of the diluted developer is taken and used only for one batch of prints. A developer consisting of hydroquinone 1 per cent, sulfite 1 per cent, and borax 4 per cent can be used repeatedly, however, and it has the advantage of lessening the danger of unevenness in development.

Degree of development. The recognition of the point at which development should be stopped is of supreme importance, for this determines the ratio of silver to silver sulfide and, within a wide range, the final tone. There is no difficulty in the case of a single large batch in obtaining the same tone on every print, but preliminary trials are essential in order to find the degree of development that corresponds to the most desirable tone; the composition of developer, and time and temperature of development should then be recorded for the particular emulsion and negative used. If this is done with sufficient care, it is possible not only to obtain an excellent tone but to duplicate it on any subsequent occasion.

Stop bath. The use of a stop bath, always advisable in the case of a large batch of prints, has the effect of modifying the final tone slightly but definitely in the direction of yellow. This effect is counteracted by a very slight increase in the degree of development and is consequently of no practical importance.

A Correction

In the March issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA the types twisted the prices of the new Series II, 14-inch Wollensak *f*4.5 Velostigmat lenses. The prices should be $175.00 in Barrel and $187.00 in Studio Shutter.

Paris Notes

The first photographs deserving the name, that is to say, the first images of outdoor scenes obtained by means of a camera fitted with a lens, and of a degree of permanency such that subsequent action of light did not affect them, are certainly the images on metal, glass and paper rendered sensitive with bitumen of Judæ which were obtained by J. Nicéphore Niépce in the years 1822-1824, subsequent to Niépce's earlier experiments in the reproduction of engravings. Following the suggestion made some months ago by the *Revue Française de Photographie*, the French Photographic Society, in conjunction with various professional associations, has formed a committee for the commemoration of the centenary of this discovery, and has fixed the year 1924 as the most appropriate time for the celebration. Provided that the plans which are now being made come to a successful issue, an international congress of photography and an international exhibition representing the historical, artistic, scientific, industrial and commercial branches of photography will be held in Paris. The French Academy of Sciences and the Académie des Beaux Arts have already signified their patronage of this programme, and other official support may be counted upon. The difficulty which faces the promoters is that of finding a suitable place providing the accommodation which such an exhibition requires. As soon as the necessary plans have been made, particulars will be forthcoming as regards the congress. A subsequent congress, which was to have been held in London in 1915, in conjunction with the Royal Photographic Society, was in process of organization when the events of July, 1914, decided otherwise. The French organizing committee has still a lively recollection of the aid then offered in Great Britain, and hopes to receive a like support when the plans for the centenary congress are further advanced.

In a previous instalment of these notes I referred to the printer of cinematograph films designed by M. L. Lobel, in which automatic adjustment of the strength of the light is made by the passage of the negative film through the apparatus. M. Lobel has now designed a very ingenious apparatus by which the printing value of a film negative may be rated. He calls it the "Etalonneuse Filmograph." In the ordinary way a film negative is rated by eye judgment, with the aid of one or two standard negatives, a method which requires an extremely skilful operator, and even then is liable to error. An alternative method is to test the film negative by printing from it on a few test lengths of positive film under different conditions; then, after development, judging the exposure which should be given. Apart from the considerable quantity of positive film required for this process, the method takes time; and, moreover, is least efficient in these two respects under the conditions most generally prevailing in the making of cinema films, namely, the assembling of many short lengths of negative.

By means of M. Lobel's "Etalonneuse" a series of eight successive exposures are made from a single negative of the film band by successive addition of seven increasing resistances to the electric circuit. The apparatus then comes to a stop, and the negative film can then be unrolled by hand up to the point at which a notch marks the place for alteration in the strength of the light. The machine then starts again, and exposes a new series of eight from the negative presented to it. Thus it is easy, after development of the test positive film, to choose for each section of the negative the conditions of exposure which will give not simply a satisfactory positive, but the best positive which can be obtained from the negative.

At one of the recent meetings of the photo-mechanical section of the French Photographic Society, M. Démichel, a Parisian photo-engraver, described a very simple method of testing lenses to be used in process work. On the copyboard is arranged a test chart formed by placing side by side a number of prints from the same half-tone block, made with a screen of 150 lines per inch, and the camera extension is set for a reproduction to half scale. Care requires to be taken that the plane of the copyboard and that of the sensitive plate are exactly perpendicular to the optical axis. Any error in this respect is, however, shown by unequal distribution of definition in the image. The average size of the elements of the half-tone original are 1-300th of an inch, and therefore the average size of those of the reduced reproduction is 1-600th of an inch. Any lack of sharpness of the image, even when it is of the order of 1-2500th of an inch (1-100th of a millimetre), sufficiently affects the proportion of the black and

white elements forming the screen image to modify in a very marked manner the gradation of the copy, this gradation depending precisely on the proportion of the black (or white) per unit of surface.

M. Démichel has compared in this way an apochromatic Tessar and a Cooke process objective, each of about 25 inches focal length. While at *f* 15 the Tessar covered well a 20x24 plate, the extreme corners, however, showing traces of astigmatism, nothing is gained as regards sharpness or effective covering power by stopping down. On the other hand, with the Cooke process lens the plate which is sharply covered with a relatively large stop is a little smaller, but a considerably larger plate than 20x24 is covered by stopping down.

These data are plainly of value only in respect to the two lenses which were under comparison, but they show the usefulness of this simple method, which can be employed for determining the stop to be used according to the size of plate requiring to be covered when employing any one of the lenses in a process establishment.

It should be added, to avoid misunderstanding, that a test of this kind is not applicable to a lens which is to be used for the photography of relatively distant objects, *e. g.*, landscapes or architecture. A lens, as the result of its corrections having been carried out specially for use on a copying camera, may be perfect for this purpose, but distinctly imperfect for the photography of outdoor subjects; and *vice versa* the corrections of a first-rate lens for outdoor use may prove insufficient for copying work.

M. J. Demaria, president of the Chambre Syndicate Française de la Cinématographie, has recently taken the initiative towards the establishment of a museum of cinematography. Although the industry is scarcely more than 25 years of age, it is one of those in which progress has been most rapid, and a useful purpose would certainly be served, unless it is already too late, by collecting examples of apparatus of all kinds which have been successively employed, abandoned, or, as probably has been the fate of most, sold as scrap metal. The specimens collected for the museum are to be for the present in the charge of the French Photographic Society until their ultimate place of preservation has been decided.—L. P. Clerc in *The British Journal of Photography*.

A Concentrated Developer for General Use

Edgar H. Booth, B.Sc., of the University of Sydney, contributes to the *Australasian Photo-Review* a paper on this subject. He lays down as fundamental considerations that a developer intended for a variety of purposes must have the following characteristics:

It must not stain.

It must not cause chemical fog.

It must be under complete control, so as to increase or diminish absolute contrast.

It must be capable of being manufactured and stored in highly concentrated form, and keep well.

Dilutions of it for use must be capable of being made promptly.

It should be equally applicable to plates, gaslight and bromide paper.

It must be fairly inexpensive.

The formula is as follows, being essentially the M-Q developer:

Metol	5.7 grams	88 grains
Hydroquinone ..	22.6 grams	350 grains
Distilled water..	415 c. c.	14.6 fl. oz.

The water should be heated to about 110° F., the two developers dissolved, and then added:

Sodium sulphite (dry), 77.7 grams (1200 grains).

The sulphite should be stirred in, and after several minutes a grayish precipitate will form. There is then added:

Caustic soda (good quality in sticks), 14.5 grams (225 grains).

The mixture is stirred until all the soda is dissolved, rapidly filtered and stored for use. If it is intended to keep the developer for, say, three months, it is best to use small bottles. Booth has used a stock from an 8 oz. (250 c. c.) bottle at the rate of half each month and found it satisfactory, although it became slightly brown.

It will be noted that the solution contains no bromide. Bromide is not recommended to permit of the use of fast as slow plates. The best temperature for this developer is from 60° to 70° F. As it contains free caustic soda, it is necessary to use a hardening bath, if this is permissible; if not, the temperature should not be over 70° F. Alum is recommended as the hardener. Formalin may be used on plates, but there seems to be some objection to its use with films. The following are the formulas and times for the different materials:

Plates or films: tray development:

Concentrated developer	1 part
Distilled water	15 parts

Normal time, 4 minutes.

For tank development, dilute with double the quantity of water and allow 8 minutes.

For bromide papers and lantern slides the strength is the same as that for dish development given above.

For gaslight papers the dilution is also the same, but 1 drop of a 10% solution potassium bromide is added for every fluid ounce (30 c. c.) of the diluted mixture. For black and white effects 3 drops are added instead of one drop.

If slow tank development is wanted, 1 part of the strong solution is added to 63 parts of water, and the operation carried on at 65° F. For plates and films, in case of known over-exposure, 5 drops of potassium bromide solution are added to each fl. oz. (30 c. c.) If very great over-exposure is feared, the bromide should be increased. It is best to develop fully and then reduce if needed.

Simple Photo-Micrography

Photo-micrography can hardly be described as a popular branch of photography, although there is an active Photo-micrographic Society, and probably a good many workers in the provinces who do not belong to that body are fully qualified by competence and keenness for membership. Unfortunately, apart from the fact that advanced photo-micrography requires a good deal of patience and skill on the part of those who practice it, there is now one particularly solid reason why it does not appeal to any but the comparatively few, namely, the costliness of high-class apparatus. Where the higher powers are in question, as they must be, for instance, in a large proportion of medical, biological, and botanical work, not only is it essential that the microscope itself and the eyepieces and objectives should be of first-rate performance, but also the photographic arrangements must, if the best results are to be attained, be of a special description in order to secure adequate rigidity, accuracy of alignment, and satisfactory illumination. Even when only moderate powers are attempted, and an ordinary camera is mounted for photo-micrographic use upon a simple baseboard, with a plain bullseye as condenser and incandescent gas as illuminant, the outlay is considerable, if a microscope has to be procured at the price now ruling for such instruments. There are microscopes and microscopes, of course, but a big hole is made nowadays in one hundred dollars by a first-class stand with inclinable tube, a couple of oculars and objectives of low power, and a few simple accessories.

This, we repeat, is unfortunate, for photo-micrography is an extremely interesting and useful pursuit enabling photography to be profitably applied in a number of fresh and often really important directions. Morover, an immense amount of good work can be done at powers very much lower than those required for purposes of special scientific research, and without any wide knowledge of microscope technique. It is probably safe to say that the great majority of specimens such as are usually mounted for microscope observation belong to one of two classes, namely, those which cannot be satisfactorily examined with powers under × 500, and those for which powers ranging from × 20 to × 150 are amply sufficient. For the former, the photo-micrographer must have a microscope and a suitably-mounted camera in order to obtain really good results, but for objects such as can well be examined with 1-inch or ½-inch objective and an appropriate eyepiece a simple attachment to the camera is quite practical, and one or two arrangements of this sort have, in fact, been designed. An up-to-date attachment made by James Swift & Son, whose microscopes have a world-wide reputation, and who, we may be sure, would not have given their name to the instrument under allusion unless it satisfied exacting requirements in the way of precision and efficiency. It will be specially noted in connection with this simple little instrument that there is no optical departure from the system pursued with microscopes of the highest class. Not only are ordinary oculars and ordinary objectives employed, but the separation between them is that at which they are commonly placed in Swift microscopes designed for purposes of the most minute and elaborate research.

A photographer who possesses an attachment of this kind cannot, of course, hope to obtain photo-micrographs of bacilli and other almost invisible objects, but it is surprising what he can do with very little trouble and at times when ordinary photography is out of the question. Undoubtedly, it is preferable to prepare one's own slides, but for those who have not the time or

inclination to do so, plenty of interesting objects are available at a low cost, and often a single slide of, for instance, a complete insect will yield material for half-a-dozen good photo-micrographs. Very few accessories, too, are wanted. A bullseye condenser is useful, though not essential, and artificial light is better than daylight, because it is more stable. In photo-micrography there is no satisfactory rule by which exposures can be calculated, and test exposures are even more necessary than in enlarging. After a little practice tests with electric light, acetylene, or incandescent gas can be made very easily, which will suffice to indicate pretty accurately most of the exposures required to be made for a batch of similar subjects, even though the latter have to be photographed at different powers. As regards manipulation, work with an attachment such as that under allusion is an extremely simple matter. The instrument is screwed into the camera front just as if it were an ordinary lens, a specimen slide is placed in position on the stage with the illuminant behind it, and focusing is effected by means of the sliding jacket or outer tube of the attachment. By holding the circular stage between the middle finger and thumb the object can be sharply focused, even when a ½-inch in place of the standard 1-inch objective is used. To the back of the stage a fitting can be fixed, enabling a sub-stage condenser or iris diaphragm, or both, to be used, if desired. Without these additions, however, a great deal of interesting photo-micrography can be done, and for the scientific and technical worker the instrument provides a very simple and efficient means of examining the graininess of different negatives, effects of intensification, etc. It goes without saying, that where only visual observation is needed, the attachment can be used in the hand, but many may welcome the facility afforded of obtaining graphic and accurate records of the relative "fineness" or "coarseness" of various brands of plates for purposes of comparison.

Photo-micrography, like telephotography, may never become widely popular, but, like its antithesis, it has many claims to attention, and it has the advantage that no special conditions of weather or atmosphere are needed to produce good results. Simplification of the means employed is a step in the right direction, and, now that a firm of unquestioned repute has placed on the market a comprehensive instrument which any intelligent possessor of a rigid camera with a moderately-long extension can use with success, many may be induced to take up this branch who formerly regarded it as either outside their inclination or beyond their reach.—*The British Journal of Photography.*

Textile Photography

One of the most beautiful applications of the photographic process is the decoration of silk and linen for household and other purposes. A description of a practical method may be of interest to photographers who desire the production of articles of this kind for particular sales. The following plan, for which we are indebted to *Photo-Chronik*, will be found easy of application. A suitable negative is first required, not necessarily a strong one, but one having contrast, as the surface of the fabric has powerful softening effect when the printing is done in the best manner. All discolored or foggy negatives therefore are useless. For larger objects, such as covers for the seats of chairs, pillow cushions, etc., genre groups or strong, fine portrait heads are admirable. Landscape is more adapted for smaller boudoir work.

The first step to take in printing on any fabric is to prepare the surface thereof so as to keep the image quite on the surface.

A number of formulas are given, but the following is the simplest and the most effective:

White gelatine	2 gr.
Water	1 oz.

If the fabric is new, it should be very carefully cleansed from all dressing. This is important, as the materials used to give a finish to fine linen, and other stuffs of that character often contain starch gum and substances that are apt to spoil the beauty of the finished picture.

Carefully wash and thoroughly rinse in clear water, and squeeze out well before applying the sizing solution. After the fabric has been well wrung out, immerse it in the gelatine, press out the excess and stretch it to dry. This stretching may be done by placing over the lid of a box and tying it around tightly with a string. A portion will thus be kept smooth for the size of the print you need. Now make the following solution:

Ammonium chloride	10 gr.
Iceland moss	6 gr.
Boiling water	2 oz.

Keep this mixture warm until the Iceland moss is dissolved, and, when nearly cold, spread or dab it on the gelatinized fabric with a soft camel's-hair brush, taking care to spread evenly and to avoid air bubbles. Allow the fabric to dry again and then it is ready for the sensitizer.

The sensitizing bath is made as follows:

Water (dist.)	2 oz.
Nitrate silver	70 gr.
Alum	4 gr.
Nitric acid	4 drops

Float the fabric as prepared above on this bath for fifteen minutes. Dry and hold over ammonia to fume for five minutes.

Arrange the printing frame so as to accommodate the frame with the fabric. A good plan is to cut a hole in a piece of board that takes the place of the usual back of the printing frame, and of such a size to receive tightly the stretched fabric on the box.

The board should also fit tightly into the printing frame, and the hole must, of course, come over the part of the negative it is desired to print on the fabric.

A couple of pieces of thin wood may be made to take the place of the brass springs of the printing frame and two corks placed under them give the necessary pressure.

Another plan is to place the board containing the sensitized fabric into the printing frame in the usual place of the negative. Then attach the negative to the frame by a hinge made of a piece of linen carefully glued to both frame and negative and fixed in such a manner that it can be readily moved on and off the fabric without failing to register. This gives an opportunity to watch the progress of the printing from time to time. Otherwise you will have to determine the extent of printing by a test piece of silver paper.

When the printing is sufficiently deep (you need not over-print as with silver paper), wash the material in two or three changes of water and tone in any ordinary gold bath, taking care to tone to a deep blue or black. Wash again, and fix in hypo (1-4) for twenty minutes or half an hour.

The Tenth Edition of Hammer's Little Book has just been received from the Hammer Dry Plate Co., St. Louis, Mo. The Little Book is really an encyclopedia in a condensed form and contains information that is useful to everybody interested in photography. A copy will be mailed free upon request.

Correcting the Blue Tint in Autochroms

It is well known to those who are experienced in autochrom work that unless the plate is protected by a yellow screen, ordinary outdoor pictures will show a distinct blue tint, which is not at all agreeable, and even occasionally with screens of moderate density a blue cast appears in scenes in which considerable sky light is present. The cause is the sensitiveness of the plate to the blue end of the spectrum, and although the ultra-violet light is mainly cut off by the lenses, yet when abundant, some of it may get through. A communication made to the French Society of Photography, published in the *Photo-Revue*, presents an interesting discussion of this subject. It appears that the tendency to blueness is more marked in the emulsion nowadays used than formerly. The predominance of the tint is most striking when it is examined by daylight. With slides, shown in the ordinary lantern, less effect is seen, as the predominance of the red end of the spectrum overcomes the blue tint. Two methods of correcting the tint are given.

(1) Modify the sensibility by immersion of the plate in a bath of colors of such character as to change the response of the plate to the several parts of the spectrum. This is an inconvenient method, as it involves complicated manipulations, is not always successful and prevents the use of the plates just as purchased. Excellent results, however, can be obtained by it, as was shown in an exhibition at a meeting of the Society a couple of years ago.

(2) Employ a screen which cuts out a greater part of the blue end of the spectrum than does the standard screen which was originally furnished by the makers of autochroms. Amateurs cannot, as a rule, make such screens, as a good deal of knowledge of absorption spectra and numerous tests by the spectrograph will be required. Such a screen, however, when properly made, gives good results with the minimum of trouble. Mr. Corvée has suggested the use of a glass screen slightly tinted yellowish orange, such as is sometimes used with orthochromatic plates. The intensity of this screen is such as to about double the exposure. Plates of early manufacture give with such a screen an agreeable yellowish tint when used in full sunshine. With the emulsions of more recent make, the author has obtained a rather distinctly accentuated bluish green. The exposure was definitely increased in such a way as to eliminate all

cause of blue from under-exposure. It is reasonable to infer from the experiment, which was several times repeated, that if by the employment of the yellow screen the dominant tint has been displaced from the bluish violet towards the bluish green, the employment of a somewhat redder screen will give a better result. To test out these points the author has made a number of exposures on freshly made autochroms, by interposing for brief periods successively, a yellow and then a red screen. Such screens should be of good quality, the best ones being those prepared with gelatin films. A Wratten G screen—sharply defined absorption, intended for telephotography—and a screen of the same firm intended for three-color work were used. The details of a few experiments are as follows:

Lumière standard screen only,
80% of the exposure

Supplemented by G screen,
14% of the exposure

Screen A substituted for G,
6% of the exposure

Screen G intercepts the rays below 4800 angström units, that is, the indigo and violet, allows a small amount of blue to pass, and all of the green, red and yellow red. Screen A absorbs up to 5800 angström units, that is, allows a part of the yellow to pass, and all of the red and orange, but cuts off sharply all below 5800 AU. This systematic use of red and yellow screen would seem to have inevitably the effect of giving a dominant blue that will be a blemish to the picture, but the whites obtained are remarkably pure. Practically the exposure being several seconds, at least, it will be always easy to place before the lens one screen and then the other, which can be manipulated without disturbing the camera.

Flash Powders

Jacobsohn treats this subject in some detail in the *Photographische Rundschau*, with especial reference to the preparation of such powders by the photographer himself. Unless such manufacture is carried out with care, and in accordance with proper formulas, great danger is incurred. The properties of a flashlight mixture are determined by the following points: Illuminating power; Rapid combustion; Amount of smoke; Character of the products of combustion; Safety of the material as ready for use. A study of some of the forms of powders is presented in the article. As is well-known, the basis material in the common forms is magnesium powder, though aluminum is sometimes used. While a thin wire or slender ribbon of magnesium can be easily lighted, a heap of magnesium powder is more difficult and burns rather slowly without much flame effect. The lack of free supply of oxygen prevents the full development of the illuminating power. Powdered magnesium, dropped through a flame, burns rapidly and with intense brightness. Nevertheless this combustion is not quick enough for some classes of exposures, especially portrait work. To secure the necessary rapidity, the magnesium must be incorporated with some substances that can furnish large amounts of oxygen promptly. In this way, mixtures are obtained which burn with great rapidity and emit a large amount of light of high actinic power.

The oldest form of such powder was a mixture of magnesium and potassium chlorate, but it could be ignited by pressure or a blow, detonated with violence, and hence required great care in its preparation, storage, transportation and use. It was satisfactory from the point of view of rapidity and light production. The substitution of potassium perchlorate for the chlorate was a step in the direction of safety, although theoretically, the perchlorate ought to be more unstable. A mixture of 10 parts by weight of magnesium and 14 parts of potassium perchlorate was found to be as efficient as the chlorate mixture, but decidedly less sensitive to shock. A mixture of 10 parts of magnesium with 7.5 parts of potassium permanganate is stated to be also immune to shock, but while having no special advantage over the perchlorate, it has the disadvantage of emitting an offensive vapor. Manganese dioxide has been used, and has been found satisfactory. Chromic compounds are inapplicable.

The later forms of flashpowder employ nitrates as oxidizers. The nitrates of the rarer metals such as thorium and zirconium, are especially brilliant illuminators. Novak advises a mixture of 1 part of magnesium and 0.5 parts of thorium nitrate, which he states gives twice the light of the permanganate mixture, and emits about half the products of combustion. The brilliancy is partly due to the incandescence of the oxides produced when the nitrates are reduced. In fact, the condition during the burning is similar to that which occurs when the Welsbach mantle is heated.

All these mixtures are more or less explosive, and, therefore, care must be taken in their manufacture, storage and transportation. The several ingredients must be in very fine powder, which powdering must be done before they are mixed. Eder and Valenta have shown that in highly explosive mixtures a portion of the powder will be blown away without burning. It is obvious that the ingredients should be thoroughly mixed, so that every part of the mixture shall have the same composition, and it is much the best to use the mixture soon after preparation. For igniting the powder, Jacobsohn recommends slender strips of celluloid.

If an object rich in color is photographed by the ordinary powders, false tone-values will be obtained, due to the fact that the light is rich in the blue rays and their immediate associates. To secure a better result, materials should be added which will give more of yellowish-red to the flame. In fact, a sort of "panchromatic" powder, a yellow screen and plates with wide color range are needed. The following is given as a receipt for a panchromatic powder.

Barium nitrate	50 parts
Strontium carbonate	40 parts
Aluminum	30 parts
Magnesium	5 parts

Experience has shown that it is possible to make up flashpowders by many different formulas, but that each has its advantages and disadvantages. Jacobsohn thinks that the magnesium-thorium nitrate mixture is about the best, but the thorium salt is not readily obtainable in ordinary supply houses, and those who make their own powder will turn to substances less expensive and more easily obtained. Under any circumstances great care should be taken in preparing such mixtures, and it will generally be found safer and more economical to use the well recommended commercial articles; in fact they are far better than trying to do it yourself. The knowledge of the danger of the older forms of flash powder was obtained by numerous disasters attended by loss of life and property, and it was well established that some of the forms, while but little sensitive to shock when first made, become very sensitive in course of time. This was especially true of the powders containing magnesium and picric acid. It seems that in time a readily explosive magnesium picrate is formed, which acts as an initiative to the rest of the powder.

Whether the German writer is unaware of the numerous formulas that have been employed in the manufacture of flash-powders, or passes them over as of no present value, cannot be determined, but those interested in the subject know the many expedients that have been suggested and tried to secure an efficient and safe material. Many serious accidents have happened, some of them wholly inexplicable under the ordinary theories of the actions of explosives. It appears, however, that the materials now furnished by reputable houses are fairly safe, but care is always required in using them.

About Mountants

According to Dr. Valenta, if starch is treated with aqueous alkali under certain conditions, it swells up forming a viscid mass having strong adhesive properties, but just on account of this alkalinity cannot, unfortunately, be used by the photographer.

The best adhesives for photographic purposes are composed of starch in combination with gum arabic or dextrine, which have the further advantage of being pulpy at an ordinary degree of heat.

An excellent mountant of this nature is made as follows, and it does not penetrate the paper so as to do injury to the print:

White gum arabic............	1 oz.
Water	3½ oz.

After solution, filter through coarse muslin.

Now, take ordinary starch, 7 drams, broken to powder; place in suitable vessel, aluminum or agateware, add the solution of gum, a little at a time, to make a cream and heat over a water bath or double boiler until the paste gets the proper consistency. A dram of powdered sugar may be added.

A good formula for dextrine paste is as follows:

Dextrine	75 parts
Alum	4 parts
Sugar	15 parts
Water	120 parts
Carbolic acid (1-10)........	5 parts

Mixtures of starch paste and dextrine form most of the pastes on the market for photographic purposes. Some of them contain a small quantity of glycerine, but the glycerine must not exceed a certain percentage, as it interferes with the drying.

Gelatine in aqueous solution (the usual form) has a tendency to penetrate the

paper. A small quantity of amyl alcohol (fusel oil) is said to prevent this and also to preserve the paste.

Liesegang recommends the use of good white glue, free of acid, to be first swelled in a little water, this water drained off and the adding of amyl alcohol with constant stirring (1 dram amyl alcohol to 4 ounces of glue). If desired this mountant may be diluted with water. It sticks well, but must be used warm.

Compounds of glue and starch paste, to which a greater or less quantity of turpentine is added, possess strong adhesive properties.

An excellent paste of this kind is made as follows: Good white glue is soaked, 10 drams in 3 ounces of water, and then melted over a water bath, to this is added, while still hot, one to two ounces of starch paste, with constant stirring. When thoroughly incorporated, add 2 drams of turpentine, gradually, until a thick liquid is formed.

Relativity in Photography

The Einstein theories, over which the scientific world continues to flutter itself, may not, perhaps, be accepted in their entirety by everybody. They involve, however, a fundamental truth too often neglected, namely, that all phenomena should be examined and analyzed from every possible point of view, instead of being, as it were, classified, pigeon-holed, and dealt with from a single limited aspect. We receive, also, a useful reminder that even long-established laws are not necessarily absolute and infallible, but are often found to break down, or to fail in exactness, through neglect of some unknown or overlooked factor. The photographer, in company with the astronomer and physicist, may profitably examine his daily practice, in search of any omission on his own part to recollect the relativity or inter-relationship of things.

The importance of psychology, which is simply a mental adjustment of relativity in its personal outlook, in attracting sitters to the studio and intelligently handling them when there, has already been pointed out, and need not here be referred to.

The relativity of the operator's own viewpoint, as compared with the position of the camera lens, often receives insufficient attention. Whatever he may fancy, an upside-down image on the ground-glass affords but little guidance, while the facts gained by an actual inspection of the subject may be quite misleading, since the operator generally steps out a foot or so to one side of the camera, and his head is also usually higher than the lens. This not only interferes with a really accurate judgment of the pose, but even subtly modifies the lighting and expression. As the sprightly young Barnacle says, in "Little Dorrit": "You don't regard it from the right point of view. It is the point of view that is the essential thing."

Much of that vague disappointment so frequently felt by the photographer at the discrepancies between his results and his anticipations is really due to the foregoing cause alone. Practically speaking, the uncertainty and disparity can only be overcome by the use of a reflex camera. The portraitist of Daguerreotype days, when the sitter was perched on a raised platform to bring him nearer the skylight, appears to have realized the difficulty, as far as height is concerned, since old engravings show that the steps on which the operator himself mounted were always lower than the platform.

The focal length of the lens is another important factor. An unduly short-focus lens used for portraiture will introduce apparent distortion in the nearer parts of the subject, owing to the close viewpoint. This, again, is an effect of relativity rather than unreality, since the results so obtained would appear correct if held at a distance from the eye equal to the focal length of the lens, or if taken with a pair of identical lenses and inspected in the stereoscope.

The relativity of the shutter, too, needs consideration. A press photographer, for instance, caused surprise lately among his coterie of friends by expressing a preference for a fast type of diaphragm shutter over the focal-plane, on the somewhat novel ground that it gave better definition. This was hotly disputed, but a little reflection should have shown the perfect correctness of the statement, since the diaphragm shutter, for an appreciable part of the exposure, acts as a small stop. The curious diversity sometimes met with in different focal-plane photographs of the same subject, according to the direction in which the blind was traveling, and the occasional travesties of possibility seen in projected cinematograph films, such as cab-wheels moving backwards if they happened to be running at a certain speed when taken, are further examples of shutter relativity.

Then there is the relativity of the exposure to the correct rendering of contrast

and tone values. Every operator knows how under-exposure increases contrast and diminishes the shadow detail, while over-exposure reduces contrast and has a general flattening effect. What is not always so fully grasped is, how vitally the features and expression in a portrait may thereby be affected, so that the result ceases to be truthful. The lines, wrinkles and hollows in a somewhat strongly marked face are hideously and exaggeratedly emphasized in under-exposure; whereas, in over-exposure, the tendency is the other way, and what little character may already be present in rather inane features is tamed down and extinguished. Obviously, the hint is not without its value, since it enables us to give more firmness to a flabby, vapid face by slight under-exposure, or to soften undue asperities in a stronger one by over-exposing a trifle.

The relativity of orthochromatism to a faithful and convincing record need scarcely be insisted on. The use of orthochromatic plates and films in studios is, as might be expected, steadily on the increase. The employment of a screen is not always practicable, on account of the lengthened exposure, but even without one the results are distinctly superior to those on ordinary plates.

A faithful depiction of the original light and shade in the subject depends not only on reasonably correct exposure, within the latitude of the plate, but on the duration of development, since this will affect the contrast. Yet the amount of contrast desirable is, to some extent, a matter of relativity, as it will vary in the final result according to the printing process. A negative not contrasty enough for a bromide print may still give an excellent result with a vigorous gaslight paper. Indeed, there is now such a wide range of rapidities and surfaces to choose from, capable of so greatly modifying the ultimate effect, that it becomes rather a bold venture to declare too dogmatically whether the negative of any given print was good or bad.

Relativity is even more startlingly evident in the mutual opposition of mount and print. The self-same photograph may be made to seem darker or lighter, warmer or colder in tone, by mere variation in the depth and tint of the mount. An amusing tale is being told by a well-known worker of a lady who brought back all her photographs, alleging that they were far too dark and heavy. Not wishing to have them printed afresh, and noticing that the mounts were comparatively light, the astute proprietor had the pictures detached and placed on mounts darker than themselves. This time the photographs gave every satisfaction, the fair sitter declaring how much better they were than "those other things!"

It will be seen that relativity plays a much larger part in photography than many might imagine, influencing, qualifying, or radically changing the work at almost every stage, and frequently in a quite unsuspected way. So much for the facts we know. It is equally certain that numerous uncharted depths still remain to be sounded.—A. Lockett in *The British Journal of Photography.*

Intensification of Autochrom Lantern Slides

V. Cremier, in *Photo-Revue*, gives procedures for this purpose, beginning with a chlorine bleaching agent prepared by the following formula:

Water	250 c.c.
Potassium bichromate	20 grams
Hydrochloric acid	10 c.c.

The exact proportions are not necessary, but in this work it must be always borne in mind that the autochrom emulsions are rather delicate, and, therefore, very strong solutions should not be used. A chlor-chromic solution is on the market, being furnished by the Lumière Company, in a finely powdered form readily soluble in water. A very small amount of this in 100 c.c. gives a satisfactory bath. If the operator prepares the solution, it will be of much advantage to powder the bichromate very finely, or to purchase the powdered form, as the ordinary crystals are slow of solution. (It is likely that sodium bichromate will serve as a substitute.) This chlorinating bath must not be confused with the oxidizing bath prepared by mixing bichromate and dilute sulphuric acid, such as is used for inverting the image in the ordinary autochrom procedure. The two solutions have entirely different chemical effects on the emulsion. In some photographic work the two solutions are about similar in action, but not in the case in hand, for the sulphur-bichromate bath completely destroys the image, while if the hydrochloric-bichromate mixture should be used for reversal, the effect will be a fogging of the plate. It is well, therefore, to mark the two solutions distinctly in order that they may not be inadvertently used.

The solution prescribed above is very concentrated, and for use should be consid-

erably diluted, say to four or even eight times its volume by adding water. The bath may be slightly warm in winter, but of course, only very slightly, or the emulsion will be loosened. The plate to be intensified is allowed to dry and then immersed in the dilute bath. The image quickly weakens. One or two minutes are usually sufficient, after which the plate is washed in running water. It is not necessary to wait for the complete disappearance of the positive image, which, indeed may not occur in the time given. The washing will be most satisfactorily carried out if the water is allowed to fall in a light, thin stream on the plate. Washing in a dish runs the risk of incompleteness. Traces of bichromate remaining in the film will act as local retarders in the development. After a few minutes' rinsing, the plate is immersed in the redeveloper. The French worker, of course, prefers the so-called metoquinone (metol-hydroquinone) or diaminophenol hydrochloride (amidol), but presumably other standard developers will serve as well. The important condition is that this second developer should contain little or no bromide, and should be rather concentrated. The image appears rapidly in this second developer, if one examines it by reflected light, but to get the best results, extending the development into the depths of the emulsion, the action should be continued for several minutes.

If after such procedures, the colors are not sufficiently brilliant, the operations should be repeated from the beginning. It is possible to make several such repetitions, which is an advantage of this method of intensification. It is, however, best to allow the plate to dry before repeating, since if the plate is kept too long in the water or passed through too many solutions, injury may be done and green stains be produced. After completion of the intensification to the desired degree the plate is briefly washed and dried; no fixing is necessary.

Copying in Black and White

The photographer is frequently called upon to make a copy in black and white; that is, to reproduce a drawing or engraving in *facsimile*.

If he is inexperienced in such work, he discovers that the ordinary methods of exposure and development fail to yield results which give intense black lines upon a perfectly clear white ground. The ground is generally tinged and the lines are apt to show up greyish. Special plates are upon the market, which are recommended especially for such purpose, a plate of a slow emulsion, capable of being developed to a good intensity.

For simple line work, where the ground of the paper is clear and white, excellent results accrue, but the photographer finds that he has to encounter subjects which do not meet these conditions, and discovers that the process plate is not always equal to the occasion. He may be commissioned to copy a deed or an old manuscript, yellowed by age, and with an ordinary process plate it is found that the yellow tinge of the document comes out much darker than in the original, and the contrasts between the writing and the ground are not sufficient to give a faultless impression.

It will be found that for such subjects a slow orthochromatic plate is essential, and, besides, such a plate copies equally as well when the subject is upon a clear white surface. In any sort of copying, care must be taken in the illumination that the grain of the paper is not over-emphasized. A side light dare not be used, as this illumination would cause the grain of the paper to cast a shadow which would be seen in the copy. It is necessary to use a front flat light. To get such a lighting, surround the copy with white cards on both sides.

Exposure should always be full, but not excessive, but never undertimed. It is better also to use a small aperture of the lens, so as to get uniform illumination over the plate, but not necessarily the smallest stop.

In development, what is wanted is good density. Hydroquinone may be used, but pyro is preferable, because the development may be carried to the limit.

The following formula is excellent for this special work:

Sodium Carbonate, gran.	1 oz.
Sodium Sulphite, gran.	2 oz.
Bromide Potassium	60 gr.
Water	64 oz.

To get the full energy of the pyro, it should be added when needed at the time of development. If you use ten ounces of the above, add to it thirty grains of pyro.

The image comes up slowly, but gradually attains great density, with clear lines.

When proper density is secured, rinse off the plate and place it in a bath of citric acid, thirty grains, water, sixteen ounces, for five minutes. Wash off under the tap for three minutes and fix in plain hypo bath or in acid-fixing bath. The prints may be made upon bromide paper.

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COLOR AND MONOCHROME PHOTOGRAPHIC REPRODUCTION

PHOTOGRAPHY as a means of artistic reproduction of Nature has come to its place among the other pictorial reproductory modes of monochrome. This position has been attained only after a struggle to overcome the prejudices naturally aroused in the ranks of the painter who had, at least, to acknowledge its great superiority over manual dexterity as a means of graphic expression. Nevertheless, the painter had a valid contention in his argument that the best pictorial work by the camera showed a notable falling off in its effort to translate tonal-color-values. And it must be candidly confessed that, notwithstanding the great advance made towards correction of this inversity of the sensitive film, the great desideratum is still for an adequate reproduction in the monochrome photograph of the various tones and gradations which Nature presents in her marvelous coloration.

Here the photo-artist is forced to pursue a method of compromise to get any approximate return commensurate with that of the artist who uses monochrome pigments in his reproduction of color values.

Here the photographer is much more hampered than is the painter, who may call to his aid mechanical means not admissible to legitimate performance by photographic method.

And, furthermore, the photographer is at a disadvantage even when he may, in a measure, at least, avail himself of the resources of orthochromacy in equalizing light action to the correction of the falsity, incident to the ordinary sensitive film—this disadvantage is apparent when he has to work upon subjects varying considerably in the intensity of the illumination.

If, for instance, the photographer shall undertake to reproduce a summer

landscape and make a print from the negative produced in a medium which gives gradations from the highest light to deepest shadow—(that is presupposing an ideal printing process)—how will the photograph compare with, say, a fine engraving?

Let us assume that our scene has summer's vivid coloration—red, orange, blue, green, yellow spectrum colors, and as well, these colors in a lower key, as Nature always presents in the shadows of a sunlit landscape together with the contrasts, existing between the light of the sky and the general illumination of the landscape. What difference is seen in the monochromes by the two different methods of reproduction?

As many of the colors considered possess visual intensities out of all proportion to their chemical activities upon the sensitive film, it is manifestly impossible for the photograph to render the subject relatively as correct in tonal values as the India ink picture or the engraving.

However, in justice to the photograph, we must perforce, take into account that the artist's technique or method of operating with his pigments on the white ground, his lines and dots and successive washes of ink, has a good deal effect upon the trained judgment of how we are to estimate its quality; and this education may bias the spectator's decision unduly, and tend to blind him to the really closer-to-Nature reproduction of the photograph, because its estimation involves a less conventional consideration.

The discussion of the relative merits of the artist's work and the work by the camera should, in justice to both artist and cameraist, be more adequately treated than it is here possible, and so, admitting the restriction encountered by the photographer, who has art aspirations in his effort as faithful reproduction, let us try to show how he may, with imposed conditions, give in his picture a close approximation to the best work of the art monochrome and with the compensation of greater accuracy in linear presentation than is possible with the best of graphic art.

The shortcoming, in reference to the inadequacy of the film to translate the relativity of tonal values, is pleaded too often in extenuation for imperfect outcome. Granting such limitation, the fault should not be aggravated by contributory neglect on the part of the photographer to avail himself of methods of control in diminution of this idiosyncrasy of the ordinary film. It is to a considerable extent within the power of the manipulator to make up for the plate's inadequacy.

Skillful management in exposure and development can do much to reduce this discrepancy. Our modern sensitive film has a wider range, in rendition of tonal values, than the ordinary worker accredits to it; that is, we mean to say, used with correctives. Like any delicate temperamental subject, its propensities to go wrong must be checked by prophylactic treatment.

In the exposure of the plate it is possible to get better relativity of values in dark and light by proper distribution of the light, preserving the numerical ratio between the light falling upon different parts of the subject. That is, have harmonious illumination, not pronounced contrasts. Careless and indiffer-

"MRS. G."

W. FRANK GOODNER

"THE DANCER IN ACTION" W. FRANK GOODNER

ent workers do not even get out of the ordinary plate what it might give in rendition of the tardy action of certain colors.

If a plate is exposed for a very brief period, even when the subject is brilliantly illuminated, we shall find, on development, that the ratios are steeper between extremes than when longer timing is indulged in and the plate judiciously developed; that is, there is better rendition of the green, yellow, and even the red, when the exposure is prolonged to the verge of fog.

We have heard the statement that the only control possible in development lies in the means of securing greater or less density of image and that any chance of control of gradation is small, depending more or less on the nature of the subject photographed.

But every experienced photographer knows that adaptation of exposure to development secures greater gradation. With prolonged exposure the rays towards the red end of the spectrum, the waves of light of greater amplitude have some opportunity for getting response and if care be taken to avoid solarization, we get better approximation to true tonal values; of course, this implies that precaution is taken to reduce the whole of the light entering the camera; effected by using a small aperture in the lens—stopping down. It would follow, therefore, that if relativity is wanted the exposure cannot be a snapshot nor can we use a large opening for light ingress.

Now it is not to be interpreted from all this that we discount the worth of orthochromacy or advocate the use of a slow plate or a small stop, but this we might venture. In landscape, where time may often be given without fear of encountering disturbance of the foliage from wind or other agency of movement, prolongation of the exposure may be indulged in even to the danger edge, so that the greens may show gradation and tonal values. Not to do so by the photographer, is sinning against light, for very often the rendition of the greens of a landscape by an ordinary plate is superior to what is possible by use of a specially sensitized film for green.

MANIPULATING THE PICTURE

AN artist in thought and deed will find scope for expression of his individuality in any method of manipulation imposed, and if he elects photography to give utterance to his conception, he will submit to the conditions of camera practice and not use the instrument as a means of sophistication to imitate what can be more effectively done by some other mode of reproduction.

But, it is more desirable for the photographer of artistic aspiration, who is not self-possessed of the ability to manage all the means essential to successful issue for artistic presentation, to seek control over the photo means, than to trust solely to inspiration, and suffer himself to be the sport of their unregulated humors; because we have to acknowledge the limitations imposed, initial to the method, but, as for that, is not all artistic performance, whether by pigment and brush or lens and chemicals, obtained by compromise to conditions imposed?

We are compelled to make variations from the scale of light and shade as presented by Nature, even when the easel is used, but the impediments to a fair approximation of relativity of intensities is manifold increased in photographic art by reason of greater deviation in correspondence incident upon the peculiarity of the sensitive surface.

The photo-artist should keep in mind, always, that the negative is merely the means to the end, not the end in itself. The print is his ultimate purpose for artistic expression, and what he especially desires is not perfection of scale of gradation in the negative (an impossibility), but some final method in the printing process which shall enable him to approach the relativity of intensities Nature presents. Even suppose him possessed with means of scientific control of gradations in the negative, he will find himself all at sea if he has no means for translation, and in fact he has no such resource in any present positive means of reversal. His only recourse would seem to be to work backward and make a negative adapted to the deficiencies of the printing medium. The consciousness of the uncertainty attending photographic processes is really a stimulus to the photographer to control what is refractory to the expression of the personal equation. He feels he dare not rely too implicitly on the outcome by conventional treatment, and of a consequence is more vigilant in noticing deviation from his artistic standard.

It is for this reason that the individuality of the photo-artist is more pronounced in manipulation in gum-bi-chromate, bromoil and like methods of positive printing, than in P. O. P. or even developing papers. He learns to correct at every step the deficiencies of his method and even to materially change his original purpose.

Remember that a photo-picture, in the true meaning of that word, is not completed when the exposure has been made and the plate skillfully developed, that is—when the negative has been satisfactorily evolved. Too many artists think so, however, and implicitly rely upon what they call the beautiful technique of the negative.

The artist must be thoroughly conversant with the possibility of his negative as well as its means for expression in the print, so that it is possible, nay, even probable for the artist to so make the negative that a technician would condemn it and yet such a negative might be eminently suitable to express his artistic desires. This implies that individuality of treatment finds best means of expression in control printing.

How many have had the experience, say, in platinum printing, in discovering that certain of the prints from the identical negative are very much superior to others on which the same care had been expended?

Naturally, the photographer seeks for some general principles to give such constant results, only to find the futility of his endeavor. Yet such must exist. It cannot be ascribed to chance—what it does signify, however, is the certification of the fact that it must be sought for in the printing process and is not derivative from the negative. It proves, too, that there are qualifications,

variations and treatments with the same material under apparently identical conditions.

One thing we may say, however, control is facilitated in the finality by taking care that it is assured in all the operations preceding the ultimate one. Control all along the line, in selection, illumination, exposure, development, and in the printing; but withal, let us not forget the psychic factor in control.

Intuitive perception and inspiration largely govern artistic performance, and though beauty is not to be controlled by any mechanical law, no doubt there is such a thing as the philosophy of art, a scientific basis for aesthetic conception.

THE PHOTOGRAPHING OF TYPES—SADAKICHI HARTMANN

THE photographing of types would be a more favorite pastime if types were easier to locate and easier to get at. Every snapshooter, amateur and pictorialist welcomes subjects of this kind, and even the professional will interrupt his routine work to have a chance at something picturesque and characteristic. But somehow, most of our American types, as we see them in exhibitions, do not satisfy. There is something lacking. Is this the fault of the treatment, or of the pictorial limitations of the subject? Let us investigate.

The seven accompanying illustrations furnish about as good an example as I could find. Mr. Barnhill did his work conscientiously, as well as he knew how. It was to him an experiment, a trip of exploitation and possible conquest. He invaded a comparatively undiscovered territory, found some interesting characters, and interpreted them at occupations and in surroundings that have the merit of being typical and semi-pictorial.

The Blue Ridge Mountains of North Carolina ought to be a favorable locality. The mountain folks about there can claim an ancestry of almost two hundred years. Partly through the unapproachableness of these regions, and partly through the frugal wants of its pioneer settlers, life has remained decidedly primitive thereabouts. On the small truck farms they still break up the ground with a heavy branch instead of a harrow, use sleds for hauling in the corn, and make cider by pressing the juice out of the apple pulp by the weight of stones.

Here surely is some material on hand! But we have to disillusionize our readers at the very start. True, there are the home industries, and some interesting types of old men and women. But they do not wear any picturesque costumes, and there is a dire absence of color and contrast. Their ramshackle one or two room log cabins are invariably unpainted and black with age. There is not much room for poetical suggestion or temperamental display.

So it seems, but just wait a bit. Take, for instance, fig. A. You must admit, an excellent theme. For fifty years or more the old couple has been sitting, day after day, for hours, particularly in the twilight, before the same

old fireplace. It represents the center of home life and the most domestic scene of these regions. I believe a real picture could be made of this. Fig. A merely suggests a picture, but does not carry it out. It would need much more simplification, finer linework, better spacing, more massiveness in the general treatment. But the original plan, the half symmetrical posing of the two figures against the fire place seen in perspective, and the memento littered mantelpiece is a good pictorial idea. The details are necessary, and there is no objection to the stolid, facial expression of the sitters, or their particular listless attitudes. What would have brought out the merits of this composition would have been a concentration of light. But how to get this in a one room log cabin is a problem. The old folks would never have admitted flashlight in their house. They are not sociable. They do not care to be photographed. You have to hang around a day or two before you are on intimate terms enough to suggest anything like photographing them, and then you have to make haste about it. Although the types and natural backgrounds are there, I think it is an exceedingly difficult subject to take successfully, and it would involve much time and patience, and of course considerable skill whenever opportunities offer themselves.

Fig. B, the old mountain fiddler, is as good a character type as one can find anywhere. His patched up clothes, his precious weatherstained violin that emits such old tunes as "The Arkansaw Traveler," the knotted and yet nimble hands, the suave and yet so matter-of-fact face, all contain notes of interest. The photographer, I fear, concentrated the interest too much on the violin. The face and hands are not decided enough in line. The attitude is good. He may just sit that way when he plays at community dances. But why

FIG. A © BARNHILL STUDIOS

"MRS. F. AND DAUGHTER" W. FRANK GOODNER

"THE DANCER IN REPOSE" W. FRANK GOODNER

this light background? The figure is precise enough in outline to have stood either a much lighter or much darker background.

Making butter with the dasher churn (fig. C), a bi-weekly occupation in most households, yielding a rich supply of butter and rich buttermilk which, despite what is said about moonshine, is the favorite beverage among mountain folks, is a subject that lends itself easily enough to pictorial interpretation. But it is an indifferent motif, one can not make much out of it. C is a creditable record of facts. The darkness of the upper part of the background helps the prominence of the figure, but the latter appears too monotonous in the even distribution of light. The white post to the right does not explain itself.

In the illustrations D and E we have the depictions of two real home industries, "Making Baskets" and "Hemming the Hand-Woven Coverlids." Making melon-shaped baskets from white oak splints or honeysuckle vine is a graceful occupation, and if the makers of the same were only a trifle more graceful, the pictorial results might be more gratifying. One cannot do much with middle aged and old women, they look best in repose. In D the contrast between the figure and the background is too strong, and the figure as in C too uniformly lighted. The interest should center on the hands and the basket.

FIG. B © BARNHILL STUDIOS

The right margin is inexcusable. The photographer must be a neo-impressionist to permit such a jumble of meaningless things at the edge of his picture.

Some folks out there still make their own clothes, but it is fast becoming a lost art with the younger generation. Counterpanes are now made for tourists. The patterns are simple but effective. The color schemes are rather dull. In making the pattern of a coverlid, the main object of a picture, one must show it, of course, to the best advantage. The photographer has done this. The coverlid occupies nearly one-third of the entire picture area. By taking the picture either in the early morning or late afternoon hours, he got more snap into this arrangement than most of the others. Still the sunlight is used too sparingly. The unimportant figure in the back is more boldly and better lighted than the old woman holding the finished coverlid. These are deficiencies of composition. The interpretation does not go very far beyond a successful snapshot.

But it is more than the ordinary snapshot, because all of Barnhill's work shows careful calculation. He makes up his mind as to what he wants to take, and he succeeds in telling his story. He is interested in these glimpses of old fashioned life, and wants to convey the facts—the utensils, the scene of action,

FIG. C © BARNHILL STUDIOS

the people who do it, and the way they do it. The pictorial merit seems secondary to him. Another worker might have made tonal compositions of the same subjects. No doubt, they would happen to be more pleasing to the eye, but would they have told the facts as accurately? Barnhill's series from the viewpoint of being instructive records is excellent. But only pictures E, F, G would I undertake to recommend for any more serious, artistic purposes.

I think F is about the most artistically handled one of the lot. Perhaps this came about in a natural way, without any special effort. Clay grinders and primitive kilns are not exactly a rarity about the larger towns and naturally more accessible than distant mountain homes. And for that reason one can take one's time in watching a mountain potter kneading his lumps of clay before shaping them into butter crocks, milk or molasses jars There is more energetic action about the work, and the work place is wrapped in a sort of semi-darkness, which makes it impossible to ignore light effects of one kind or another. Our picture shows a variety of high-lights, dark shadows not clearly defined, and intervening middletints, all rather confused yet combining to a sort of harmony. The trouble with Barnhill's compositions is that they generally lack a *decided* point of interest. If the subject matter is important enough and clearly told

FIG. D © BARNHILL STUDIOS

it becomes the point of interest automatically, without any special technical embellishment. But the composition remains weak. There is nothing to hold the eye and it wanders about aimlessly without getting interested. It would have been so easy, even by the means of retouching, to have forced the high-lights on the lumps of clay, on the bare forearm, the shoulder and forehead. This would at once make the rest of objects fall into their right place. The eye would take in the high-lights and the meaning of the picture at the first glance. Notice the curve of the bent figure, come to a halt in the confusion of the dark background and return to the left margin by the various objects on the wall.

G, one of the pioneer dames of Western North Carolina, who can still use her wheel and make yarn to knit the heavy woolen socks used by her family, is another delightful motif for some serious pictorial exploitation. The wheel is picturesque enough to stand where it does, and to form with the figure of the old lady the main point of interest. But it is the light and the lines of the background which make it a picture, and not merely a descriptive report. To the left there is the suggestion of sunlight and life, to the right there is the loom ready for work, and the withered grand dame standing in the cool shadow, like one of the Fates, spins the thread. All this is suggested by this photograph, but it is not strongly enough expressed for conveyance to the ordinary beholder. It merely tells the facts.

Art uses facts to transform them into something else, either by technique or emotion. The result may be nothing more than a shimmer of contrast, a tonal gratification, a bit of beautiful texture, but it must transcend the bald fact. And a wonderful idea can become pictorially beautiful and convincing only by perfection of technique.

FIG. G © BARNHILL STUDIOS

AID TO ART-MOTIVE BY MECHANICAL FACTORS—JOHN BARTLETT

IT is sometimes, captiously, contended that the artistic impulse possessed by the photographer has exercise only in his faculty of selection from Nature of what is best suited to the purpose of art. In other words, the photographer of artistic instinct is denied the power of invention.

But is not this ability of selection, which is conceded the photographer, evidence of possession of the personal endowment of imagination, which the painter has pre-eminently? But there is an objective phase, common to both painters' and photographers' art alike, which involves mechanical principles, which are analagous in the application to both means of pictorial expression, which exercises considerable influence and control over invention, selection, imagination or whatever we may look upon as supplied by the individual and not furnished by the subject. Every picture, no matter how much of the poetic phase may therein be manifest, must conform to certain mechanical

FIG. E © BARNHILL STUDIOS

principles to make it comprehensible. We leave out here consideration of cubism, symbolism, etc., which claim appeal exclusively to the psyche, and so cannot have connotation with photographic art. It is necessary for the normal artist to understand application of these mechanical means, if any intelligible, effectual results are contemplated.

Concisely put, composition is the making in an orderly way of a unified thing out of several or a number of individuals so conditioned as to convey an idea or motive in their arrangement. So the elements of a picture must have coherence of expression, must give intelligent account for their association and unification.

Have not all of us had difficulty in understanding certain writers of note on account of obscurity of style, and we lay it to the charge of lack of ability to use language appealing to our comprehension? It may be sometimes chargeable to our limitations just as we are not able without training to understand a great work of art; but often it is due to disregard of convention in construction of phrases and sentences or want of clarity in expression, which limits the appeal they can make.

Supreme art may afford to contemn rules and principles as it atones for the neglect by its great message, but artists of less power are presumptuous and

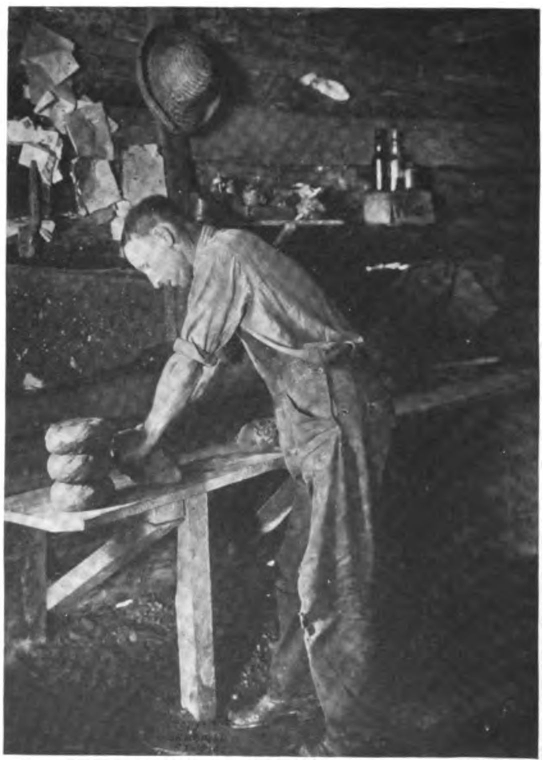

FIG. F © BARNHILL STUDIOS

unwise to overleap civil bounds and get profitless returns only. Just as rhyme, rhythm, meter, etc., in poetry are essential to adequate expression of the highest flights of the imagination, though the meter must be measured by rule, the rhyme, tried for experimentally, and the rhythm artfully managed, all mechanical operations, as much needed in nursery verse as in Milton's blank verse, so the mechanical operations in the photography of a mere record of things is no wise different in application to the highest work with the camera.

All pictures of art value must express the personal motive, must have an idea embodied; but art implies the expression must be in terms which art demands.

Certain combinations of lines, certain contrasting lights and shades, of varying dimensions and shapes, are accepted by the artist, not with protest as a necessary conformity with established convention, as an unavoidable restriction to freedom of expression, but the very channels into which his idea more readily courses—most valuable accessories to composition.

While exercising the function of the composer, the artist is often surprised at the discovery of the suggestiveness of the seemingly obstructive components with which he is working, to the elaboration or working-out of his scheme of composition. How they seem to direct him where best they should be put to effect his particular intention.

In this way a picture, though confessedly a building-up mechanically, a construction by rule and principle, seems a thing of spontaneity and impulse, which it really may be, because, while its maker is above the slavery of imposition of rule, he works in conformity with law and order.

One thing, however, is necessary before we can intelligently apply mechanical rules and principles and preclude their dominance, and that is, the possession of an idea or motive by the artist, the mental dictator of control over the willing agents at command. Otherwise his product is a thing of shreds and patches without definiteness or intention; a rhapsody of incoherent masses and unintelligible linear hieroglyphics, which convey no message.

If you have not this definiteness of purpose you find you are sailing without chart or compass, and what could have been made tractable becomes unruly and distractive. You endeavor to work out order from the chaos; you begin changes, but without any real conception why such change should be made. You note how even a slight change brings in its wake other unthought-of changes, and you are soon in "wandering mazes lost"—and the whole subject is in a muddle.

For instance, say you are working on a figure subject and have employed white drapery to set off the model or models.

You experimentally note from some impromptu notion, not from careful study of general effect, that the mass of the drapery is not particularly pleasing and you substitute a darker piece. Locally the effect is mollified, but somehow or other you have disturbed the general equilibrium. The change at any time made may do no harm generally and at the same time improve the part operated on. But if you have in mind the synthesis of the subject, and not a

vague analysis, but a definite conception of the relativity of tone of the entire picture, your picture, by the change, may be greatly improved. You must have power to mentally perceive as well as possess visual appreciation of things, and never trust to accident for chance effect from ill-defined and vague suggestion.

A load of stones dumped down on the roadside suggests no evidences of design. You would not account the carter an artist, even if accidentally the stones should group most agreeably and in conformity with artistic rule.

But let the skilled architect, following some definite plan, set these same stones in appropriate form in a beautiful edifice—a grand cathedral, perhaps, for realization of his idea—and you acclaim him an artist.

And so, too, in a picture. You must work according to plan, subject to rule, but this rule controlled by thought and purpose.

THE BEAUTY OF TREE-FLOWER PHOTOGRAPHS—L. W. BROWNELL

IT IS doubtful if there are many people who know the real beauty of the flowers of our common trees, other than those of the cherry, apple, dogwood and similar conspicuous types, and it is almost as true that there are few, if any, of our amateur camera users who devote any time to the making of photos of these blossoms. This, it seems to me, is a pity, for they lend themselves to the making of artistic pictures just as readily as do any of our flowers, and in many cases, even more so. Such photographs are useful from a botanical standpoint, provided we make them with this idea in our mind, as well as that of making them as artistically perfect as possible. But we must remember that the ultra-modern type of out-of-focus photograph is worse than useless from the standpoint of the botanist. Every detail must show up sharp and clear; there must be no clogging up of the shadows or over-exposing of the high-lights; the lighting must be fairly even over the entire subject and the exposure must be such as will give as near a perfect printing negative as it is possible to make under any and all conditions. Nor is any of this antagonistic to the making of a beautiful picture, for it is my contention that, in photography at least, clearness of detail and beauty can go hand in hand. When we focus our eye upon an object, unless we are becoming blind and cannot focus properly, we obtain a clear, well-defined image of the object, not one whose outline is blurred and indistinct. It is also true that we cannot focus our eyes upon an object, and at the same time, upon the background some distance in the rear of this object, and have both clear and sharp nor should this be expected in a photograph. It is my contention that, provided we have the principle object and its immediate surroundings in sharp focus, we can allow the background to take care of itself to a greater or lesser degree, and this is applicable to almost any kind of photography.

I think that I can hear some of my readers exclaim that there is rather a

scarcity of subjects in this particular branch of photography. It is true that there is not as great a choice in this as in some other branch, but taken in connection with our other work, there is much that one can accomplish. It is possible that my readers may not realize the number of native trees that grow in the United States. Of course all of the species of trees of this country do not grow in any one locality, but in the eastern states alone there are well over one hundred and fifty species of trees and shrubs and any one locality will produce the majority of these. Is this not enough to occupy our camera for one spring at least? There is another reason why any one who is at all interested in the great out-of-doors, should employ his camera, for part of his available time at least, in the portraying of the trees and that is that it goes a long way toward teaching us to know our trees and this is a knowledge that one cannot readily afford to depise. Later I intend to write on the photographing of the trees themselves and of their trunks, for if one would make a really comprehensive and valuable series of tree photographs, he should make six photos of each tree, that is: the full tree in summer, the full tree in winter, the trunk, the flowers, the fruit and the leaves. If one could but do this with all our native trees, he would leave behind him a fitting monument to his enterprise and photographic ability and one of such infinitely greater value than all the snapshots that he could possibly make during a long life of pressing the button that there could be no comparison between the two.

Some of my readers may raise the objection that so many of our trees have small and insignificant flowers, but this is not entirely true. It is a fact that the flowers of a number of the trees are small, but few of them are insignificant, and all of them are capable of being handled artistically, if that is

"BLOSSOMS OF WILD CHERRY" L. W. BROWNELL

the only object we would have in photographing them. If, on the other hand, our object is to form a most interesting and instructive series of photos, then the least and most insignificant of them all should not be passed by. Indeed, the smaller they are, the more reason for photographing them, for the large and showy ones we most of us know, but those that are not so readily seen, need an introduction to the majority of us and this is most readily accomplished by the use of a photograph.

It is not true that most of the trees have small flowers, as we will realize if we will go over, in our mind's eye, those trees that we know best. There are many whose flowers are very showy as the dogwood, magnolias, etc., many more whose flowers, while not quite so large, are nevertheless showy, such as the apple, basswood, thorns, etc., and many others whose flowers while being not quite so noticeable are still far from insignificant, such as the maples, oaks, etc.

Naturally the spring is the season for this particular branch of photographic work, but the season is actually spread over several months and is not so restricted as one might be led to believe. The earliest tree flower to show itself is that of the alder, the graceful tassels of which may be seen hanging from the bare branches along the borders of marshy streams, as early as the latter part of February. They are, however, closely followed by the catkins of the willows, the "pussy-willows" of our childhood, and from then until late in June we may find work for our camera in photographing the tree flowers. March and early April may be called the time of the catkins, for most of the trees that produce this form of flower bear them before the leaves appear or when they are very young. Besides the two that I have mentioned, there are many other trees that bear this form of flower. The birches, white, yellow, red and

"BLOSSOMS OF SWEET BAY" L. W. BROWNELL

black, the former bearing the daintiest drupe of them all, but each one exquisite productions of nature's art; the black walnut and butternut, whose tassels are so nearly alike that it is difficult to tell them apart and the American aspen, whose heart-shaped leaves are never still even in the calmest weather, are all members of this group, whose blossoms make really beautiful subjects for the photographer. All of the poplars, to which family the aspen belongs, bear catkins which, a little later, will cover the ground under the trees, looking for all the world like a mass of furry caterpillars. The oaks and the hickories are also of this group.

A little later come the flowers of the maples, the first to bloom. The scarlet maple even beats the catkins, bearers covering its bare branches with the scarlet blooms often as early as the last of March, making these trees conspicuous objects amidst the surroundings of a general drab color.

Later still come the more conspicuous flowers of the edible fruit trees, the magnolias, the horse chestnut, the locusts, the basswood, the tulip trees, the virburnums, the thorns, and many others almost too numerous to mention and these are the ones that clamor most loudly for recognition and which, in consequence, are the ones that are most often selected for camera studies in preference

"BLOSSOMS OF HAWTHORN" L. W. BROWNELL

to their less favored relatives. It is a fact that it is not always from them that the most artistic results may be obtained.

In April, in the deeper woods, we may find one of the daintiest of all our tree flowers, the shadbush, while at the same time, in the higher, dryer woods is its near relative, the June or service berry, with an equally dainty blossom. Both these flowers are pure white, five petaled, the latter, perhaps, averaging slightly larger than the former. Against the cold background of leafless, grey trunks and dead brown leaves they stand out with a delicate star-like beauty that is a delight to behold, nor are the photographs that can be made from them any less beautiful than the flowers themselves.

Naturally I have spoken specifically of but a few of the tree flowers, for a short article is hardly the place to catalogue them all, but it is needless to say that there are many others just as deserving of being made the subjects of your camera studies as are those that I have mentioned, and it is a large part of the pleasure of photographing them to hunt them up and identify them before making their pictures.

And now as to the best way of making these pictures. Naturally it is, at least in many instances, out of the question to photograph them in situ. Even

"WHITE OAK BLOSSOMS – QUERCUS ALBA" L. W. BROWNELL

though it might be possible to climb some of the trees and set up a camera, the resulting picture would most surely leave much to be desired. In the cases of those trees and shrubs that bear conspicuous blooms, it is desirable to make photographs of the entire tree, but this, of course, does not show the close detail of the blossoms, which is what we are after in this branch of the work. We can take a branch of the blooms home with us and photograph them indoors near a window, one with a northern exposure preferred. This has the advantage of obviating all chance that the subject may be moved by a passing breeze during the exposure but, on the other hand, it has its disadvantages also. The principal of these is the fact that most tree flowers, as well as the leaves, are very apt to fade and droop before they have been carried far and they can seldom be revived to their pristine beauty. I have found it pays to brave the breezes and make the exposure upon the flowers where they are found and with as little delay after picking them as possible.

I also have found that it is frequently well to have something to shut out the blotchy and out of focus background. For this purpose I have a piece of white cloth about two feet square attached at opposite sides to two sticks upon which it can be rolled for convenient carrying. To use the cloth it must be

"BLOSSOMS OF MOUNTAIN ASH" L. W. BROWNELL

stretched tight and the two sticks driven into the ground, when it forms a most efficient background in front of which a branch of blossoms may be "posed" to advantage. Care must be used that this "posing" is done in as natural a manner as is possible that the resulting picture may look as near as we can make it, as the flowers did in their natural position. This with no intention to deceive, but the value of these pictures from a botanical standpoint lies, to a great extent, in their absolute naturalness and so, if we want them to have value in this direction, we should exert ourselves to obtain this appearance of never having left the tree. If, however, we are only making them as artistic pictures, we can then allow our imagination to run riot in the arrangement of them.

Of course it is well to use an orthochromatic plate with a color screen and the lens should be stopped down far enough to obtain sharp detail over the entire group. This will demand an exposure of greater or less length, according to the stop we are forced to use and we must take our chances on the steadiness of the subject during this exposure. These chances may be greatly lessened by choosing a quiet day upon which to do our work, and we will find that even when there is considerable air stirring in the branches of the trees close to the ground, it is materially more quiet, especially if there is much low herbage around to act as wind shield. If we will be careful to select a branch of blooms that has the flowers, all more or less on a plane, thereby necessitating less depth of focus to make them all sharp, we will find our difficulties in this direction much lessened. By careful work, one need not lose more than one, or at the outside two, out of twelve exposures made in the field through movement of the subject during exposure. I think that my average is even less than this.

I will say to him who owns a camera and has never used it upon the tree flowers, go out upon the first opportunity that presents itself and try it. I am positive that, if you are a lover of nature, you will agree with me that it is a much more interesting use for your outfit than "shooting" your friends in different poses or even making interminable landscapes.

Improvement in Paper Negatives

Interest in the paper support for emulsions continues to widen. The *Photo-Revue* notes the introduction of a form in which the paper backing is made quite stiff so that for sizes not over 4 x 5 no metal support is needed. L. Tranchant, the author of the article, states that he has found it advantageous to push the development further than is generally recommended for this class of negatives. The makers of the film recommended a bath of formalin, glycerin and water, but Tranchant opposes the use of glycerin, and, rightly, for as noted in the August issue of The Photographic Journal of America, glycerin does not evaporate and tends to keep the film moist, which leads to fading. The formalin has a hardening (tanning) effect, as the film is a gelatin composition. The strength is 5%.

In handling these paper negatives, care must be taken not to dislodge any part of the gelatin film from the paper base, as in subsequent treatments this may lead to more or less separation and irremediable folding of the film. However, Tranchant states that when there is partial separation, the picture can be saved by draining and placing, coated side upward, on blotting paper, laying it in a dry dish and pouring on strong alcohol. It is likely that denatured alcohol or purified methyl alcohol will answer, but it is, of course, better to avoid any detachment than to be obliged to resort to such methods.

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Develop with Intelligence

Photographers, as a rule, do not estimate the value and importance of some acquaintance with the varied reagents they daily make use of and yet they are constantly complaining that a certain developer is "no good," heaping malediction on some photographic journal who speaks approvingly of it. Only the other day we were asked by a professional photographer if it were possible to again reduce a negative which had been intensified, if so, what is a good formula?

We naturally inquired what had the plate been intensified with. All he could tell was that it was a preparation some fellow photographer had given him; it was some advertised intensifier, the proprietary name of which he had forgotten. How could one answer such gross ignorance. By the way, it would be a good move to compel makers of specialties to conform to the requirements of the "pure food and drug act" to indicate the components, for most of them are poison or at least dangerous and an accident might happen. It would save time in an analysis and maybe a life.

But this aside. It was advanced only as an argument for the need of intelligence in the use of photographic reagents.

Take for instance, the developing reagents. We do not mean that the practical man needs know how to make them—that's a chemist's business—but that it is advisable for the photographer to acquaint himself with their special virtues and action.

There is quite a phalanx of them and the intelligent man avails himself of the special features of each for a particular purpose.

These agents for evolution of the image vary in the intensity of chemical and physical power and this may conveniently be called their strength.

This expression is used, for instance, in relation to the acids, and is a measure of their affinity for bases.

We speak of sulphuric acid as stronger than acetic acid, and the expression may be applied in the same way to amidol as compared, say with hydroquinone.

The "strength" of the developer, however, must be distinguished from "the power of reduction."

The quantity of silver reduced by a definite quantity of developer is a measure of its power of reduction or its reductive value.

The reductive values and strength of a developer are therefore expressions which resemble *"the equivalent"* and while *"the reductive value"* principally affects the density of the negative, the strength governs rapidity of development.

We do not, as yet, know the connection between the chemical constitution and strength of developer.

In practice we speak of rapid and slow developer, and, by comparing the time of development (similar conditions), numerical expressions may be formulated in indicating the strength of the developer.

If, for instance, we take 100 as expressing the rapidity with amidol we arrive at 25 and 33 respectively for glycin and hydroquinone.

If it is desired to arrive at the same rapidity with a developer by using different alkalies, their quantity must be determined by assimilating their same alkaline condition. For instance, if we wish to obtain the effect of 150 grains of potash by the substitution of caustic soda, the equivalent quantity of the latter, 87 grains should not be used, but a smaller quantity, because caustic soda is a much stronger alkali. We find, on trial, that it is only about 15 grains.

If the quantity of alkali in the developer is progressively increased, the rapidity increases also. This is at first very marked while further additions tend to a definite maximum.

Rapidity follows the same law governing alkalinity in its progressive concentrations. The alkalinity is proportional to the electrical conductibility of the solution. Experiment shows that the rapidity of development is inversely proportional to the electrical resistance of an alkaline solution

of the same concentration. By diluting the alkaline developer, the rapidity of action falls in proportion to the reduction of alkalinity.

Temperature, also, has great influence upon rapidity. The acceleration by heat is well-known. By varying the temperature we have the means of altering the rapidity without altering the developer contents. Hydroquinone at 32 degrees Fahrenheit is three times as slow as it is at 70 degrees. The other agents are not so marked at different degrees, somewhat removed.

Photography in Municipal Life

The city is the dominant feature of modern civilization. The trend of population into the closely-built areas, and desertion of the open country, especially farming sections, is proceeding at an increasing ratio, and the warnings of economists avail nothing of moment to stay the tendency. The increase of population not only produces continual expansion of its borders, giving rise to the "housing" problem, but it necessitates reconstruction in the older parts of the city, so that buildings are continually disappearing to make way for more pretentious structures. The skyscraper has come to stay, although efforts are being made to restrict its height.

The destruction of the older buildings is regretted by many of inhabitants of the cities and occasionally an enthusiastic admirer of some historic edifice succeeds in awakening sufficient public agitation to secure either the purchase of the property or the restraining of its removal. Of course, there are some sites that are so deeply treasured that they are safe against any Philistinism, or other motive. Philadelphia would not let Independence Hall go for any consideration. Many minor sites, however, are and, indeed, must be sacrificed for the development of a city's life.

Apart from buildings, the life of the city is largely made up of public affairs, pageants, parades, and even disasters. These show much more vividly than the buildings, the features of the city life. Until about the middle of the last century, the preservation of any object was possible only through the services of an artist, but after the invention of daguerreotype, and especially the modern rapid methods of photography, the exact features of any building can be easily obtained. A greater advance was made when the motion picture was perfected. We now have a simple method by which occurrences can be preserved.

It seems worth while for city administrations to undertake systematic methods of securing and preserving the pictures of all buildings about to be removed and of all public affairs in which the conditions are such that arrangements for taking them can be made in time. Many interesting events are now taken for exhibition in the motion picture theatres, but these are usually the work of syndicates, which are under no obligation to preserve the film after it becomes stale, and probably do not do so. It behooves the municipality to undertake the making and preservation of such films, which will prove of great interest to future generations. How interesting would it be if we had a photograph of the members of the Continental Congress signing the Declaration. We would not then have as our sole suggestion, Trumbull's erroneous painting. How valuable would be a film of Washington taking leave of the army after the announcement of the treaty of peace. We could not, of course, expect a film of Paul Revere's ride, or Washington crossing the Delaware or the capture of Major André, even if films were existent in those days, but the films which we might have had, if the procedures had been known, would have prevented the incorrect and often absurd substitutes that artists have furnished us.

It seems, therefore, that steps ought to be taken in all cities to preserve, systematically, pictures of the more important sites and films of the public occurrences. Such records will be of value not only as sources of instruction to future generations, valuable as evidence of the progress (or the reverse) of the city as a whole. Private associations are doing something in these lines, but their work is desultory, and as noted above, the records of public affairs made by the film companies are most ultimately destroyed. It will be necessary to preserve the negative in each case, so that duplicates can be made.

Faded Prints

Prints made on P. O. P. are sometimes presented to us for diagnosis as to the cause of their deterioration. Patches of the original good image is evident here and there on the surface, but there is a sickly yellow hue pervading. On inquiry, we learn that the prints are of recent make, some only a few months old.

Fortunately, some of the manipulators furnished us with data of the methods of procedure, but everyone of them persisted that the results were not due to careless manipulation—they having religiously followed the instructions accompanying the brand of paper used.

Some of the samples submitted we dismissed at once from consideration and exonerated the makers from any complicity. The poor paper, upon which the emulsion was spread, advertised their worthlessness. We selected, for investigation, therefore, only such prints as showed they were made on paper furnished by trustworthy manufacturers whose reputation had been secured by work attesting to the excellence of the products, so we could eliminate the maker in hunting after the guilty factor of destruction. Then it occurred to us that in the old albumen printing days, many a good print met with premature decay from a disease communicated by the card mount, but we found this liability might also be dismissed. Some of the prints were unmounted and those mounted were on cards by makers whose reputation for purity of stock dated back to two or three decades. Two possible factors thus excluded. What next culprit?

We noticed, on examination, that in the unassailed areas of the prints where the tone color was still vigorous, the probability is that there the toning was properly effected, that is, there it is where sufficient gold had been deposited to preserve the original beauty of the tone, so it is reasonable to infer that the deteriorated parts were the parts slighted in distribution of the gold, and hence, the susceptible silver had yielded to an alliance with inimical sulphur or some other undesirable mate which did not make a happy relationship.

Furthermore, prints soaked for some time in distilled water gave a faint acid reaction, evidence sufficient that free acid was in the film or some acid salt, and acid has no business in the film. It would put the picture out of color in a short time. We will venture, therefore, to give a probable reason for the rapid deterioration of the gelatine prints. It will be accorded that a well-toned print has a longer life than one superficially toned.

The better deposit of gold on the silver, or a reasonable substitution of gold for silver, the greater the chance of survival. Now any method which expedites the toning process abnormally (too rapid toning) prevents sufficient gold deposit. It is like poorly plated silver spoons or washed jewelry. Our correspondent kindly told us how quickly the prints toned.

In the majority of formulæ for toning P. O. P. notice how mean the content of gold. The maker thinks this a recommendation and an attractive feature to the man who must practice economy, but cheapness is a poor economist.' A reasonably rich content of gold is essential to good lasting work, and do not hurry the toning. But we forget about the acid we found.

Now, as regards the influence of an acid in liberating obnoxious products, capable of corrupting the integrity of a print, we think it crept in during the fixing. Acid fixing salts are good in their way, but their way is not salubrious for P. O. P. The action of an acid on a sub-chloride of silver would be to convert it into a chloride and silver. In case of an organic sub-salt, as we have in P. O. P., the action of an acid would be of a reducing instead of an oxidizing nature. The action of an alkali would be to form a sub-oxid. Hence, the necessity that the fixing bath for P. O. P. should be alkaline not acid.

Mercury Intensification

Intensification is generally regarded as an ameliorating process—a remedy for improper development. But while in the majority of cases it is such, there are occasions when it is preferable to get intensity by an after process than directly in the development. Where there is liability of registering halation, it would be inadvisable to recommend carrying the development to the limit of intensification of the image, for the reason that halation is imminent in the lower strata of the film, and if development be suspended before this substratum is reached, the proper density, without risk of halation, may be obtained by intensifying the upper layers of the film. Mercury, in the form of mercuric chloride, or the iodide, has always been the most generally employed agent for strengthening the image; not that it is intensifier par excellence, inasmuch as there are intensifiers for certain special purposes of more effectual application, that is, for securing the maximum of intensity, but for all practical purposes and particularly in portraiture, mercury is more easy of manipulation and more constant in returns.

The formulæ most in use employ the

chloride mercury in preference to the iodide, not that the iodide is not efficient, but because the compounding of the chloride is simpler and the results more assured. Mercuric chloride is a tardy salt to dissolve and, of a consequence, in the formulæ we find introduced means of increase of solubility.

The mercuric chloride (corrosive sublimate) is made more soluble by association with some other haloid than when submitted to the action of water alone. Ammonium chloride or sodium chloride or potassium bromide are always associated with it for facilitating its solution. Bromide is rather too expensive an associate, however, and in a measure a refinement whose purpose is filled even better by ammonium chloride. In our individual practice, we have found the addition of citric acid is also beneficial, lessening the risk of stain.

This allusion to stain reminds us that the encountering of this undesired invader is due entirely to careless manipulation, not to perversity of chemical action. The photographer must be assured, first, that the negative to be intensified has been thoroughly fixed in the hypo, and second, that it also has been thoroughly washed from every trace of the hypo salt, otherwise stain is inevitable. It is also preferable to apply the intensifier to a dried film. The action is always more uniform, and, personally, we prefer to intensify in weak daylight to using the light of the darkroom. The presence of a little light seems to expedite the process. Make up the formula as follows:

Water	8 oz.
Citric acid	40 gr.
Ammonium chloride	40 gr.

Dissolve, then add 40 grains of mercuric chloride; shake well till solution is complete. Let stand for some time, pour off the clear portion and filter this through a wad of absorbent cotton. This care is necessary, inasmuch as any undissolved particles will cause spotting of the film. Immerse the dried negative and be sure to let the film bleach thoroughly. When the bleaching is complete, that is, when the image shows up on the glass side, wash for at least fifteen minutes under the tap, then transfer to a solution of sodium sulphite, 40 grains to an ounce of water, in which the image darkens. Now wash again the film and the operation is completed. Should you happen to stain the film during manipulation (due entirely to careless manipulation) indicated by an opalescence of the film, let the plate lie for some time in the sodium sulphite solution increasing its strength. It usually disappears.

If the negative shows after development action of light fog, you first remove this fog before intensifying the film, otherwise you only strengthen the fog and further deteriorate the negative. The best remedy for removal of light fog is:

Per chloride of iron (ferric chloride)	30 gr.
Citric acid	60 gr.
Water	8 oz.

Immerse the plate for a minute or so and then note the action. Reduction may proceed too far if the plate is left too long a time in the iron solution. Wash off under the tap and immediately proceed with the intensification. By the way, the above reducer may be used to lessen intensity if desirable, either of the directly developed plate or if the mercuric intensification has been carried too far.

Negatives for Three-Color Printing from Autochroms

In any descriptions of the Autochrom plate, which I have seen, it is assumed that the development of the film is confined to that part of it which lies immediately behind the starch grain which transmits the light. But considerable experience in making negatives for three-color printing leads me to believe that this is not the case; but that grains adjoining those which transmit the light are also affected by it. And that this is the cause of certain difficulties I have found, which have not troubled me when working direct from Nature.

The printing process I use is bichromated gelatine, and artist's colors in fine powder, spread with a brush on paper; printed, and washed off with warm water. But the difficulties would apply to any process. The trouble does not lie in the printing, but in making the negatives.

There are great advantages in using the Autochrom as the original color record, instead of exposing three separate plates, especially when working from life or on landscape. But I have found that while I could always get a sky to print when working direct from Nature I could never do so from the Autochrom until I adopted the device of backing the Autochrom with a very thin negative made by white light. This plan also gave a better separation of the colors in the case of flower subjects

and such like. I was led to adopt it when trying to get negatives from a color chart made by exposing an Autochrom plate to red, green and violet light in overlapping circles. It is a nice, bright chart with a white triangle in the center, and blue, crimson and yellow outside that, and red, green and violet outside of them. Such a chart should in theory transmit an equal amount of red light through the whole of the red circle. It does not do so, but when examined through a red filter it is seen to pass more light through the crimson and yellow than through the red; and most of all through the white. And so with the other colors. And negatives made from it, even with filters of very short transmission, are more dense in the white than in the crimson and yellow, and least dense of all in the red.

Printing from such a negative—in blue, for instance—when the color is all washed off the white, there is still some blue left on the red; and development has to be continued till that has been washed off. In the case of a landscape with white clouds and a red roof, if all the blue is washed off the roof too much is washed off the sky, where the development ought to have stopped when the clouds first became white. Working direct on such a subject no such difficulty occurs. In a flower subject you either get a bright red degraded by a little blue and yellow left on it, or, if you continue development until that is washed off, you lose the shadow detail in the white flowers.

By backing such a chart with a thin negative made by white light it is possible to get even density in the resulting negative over the whole of the red circle. But, of course, the backing negative has to be developed to exactly the right contrast to get that result, and therein lies the difficulty of using this device. There seems to be nothing for it but to make another if the first does not look quite right. I have met with some success in this way, but I do not pretend to be able to succeed at the first attempt every time. With practice I think one should do so. A negative much overdeveloped gives reversal, and can be recognized as likely to do so. But different Autochroms require negatives of different character. One that has had a short first development will want very little correction. But such an Autochrom is too dull to make a pleasing transparency or to be a good guide to the final appearance which your print should have. And, of course, one of the advantages of using the Autochrom as the original record is just that you have it to guide you in the final production of your print.

The explanation seems to be that if a plate is exposed to monochromatic light and developed and fixed, but not reversed, and then examined with a microscope, it will be seen that the starch grain is not entirely obscured with a continuous coating of black, but partially covered with very small black dots; and the adjoining grains, of different colors, also have a certain amount of dots over them; in some cases isolated, in others running in chains from the exposed grain. I do not know whether this is the case with other screen plates. But if it is caused by light reflected from the starch grains it might not occur in a screen of mosaic pattern.

Where there have been two exposures, as to violet and green light, the red grains are more heavily dotted where the two exposures cross, in the blue, than in either the violet or green, though they have had no exposure to red light.

The effect, where one exposure has been made, to one color of light, is the same as if one grain had had a full exposure, and the other two a partial exposure. But in the case of compound colors, blue, crimson and yellow, two grains are exposed, and each gets a bit extra from the other. And in the case of white each grain gets what is equivalent to extra exposure, from invasion by the other two colors. The total result being the same as if the secondary colors had more exposure than the primaries, and the white most of all. It may be possible to produce a chart free from this defect. But for ordinary Autochrom work I have found my method of correction a useful aid to getting good negatives. And I shall be glad if it is of use to anyone else.

It amounts to treating the Autochrom as being unevenly flooded with white light. Possibly the more correct method might be to back the Autochrom with negatives made by light complementary to that used in making the final negatives. But such trials as I have made of this plan seem to show that it is not worth the trouble of making three backing negatives, and the risk of one of them going wrong, in registration or otherwise.

As to the filters to be used in working from Autochroms I should be glad of any advice or assistance. I have used filters of short enough transmission to give no overlap. A very good and practical judge

of color printing tells me I should use longer transmission. But I do not see why, nor have I found any advantage in filters of very short transmissions. After much experimenting with filter dyes I do not believe that a correct set of negatives could be made from color charts such as mine, by any set of filters, without some such correction as I have used. But I shall be very pleased if anyone will show me a better way, or give any information on the making of three-color negatives from Autochroms or any other screen plates.—E. A. Burchardt in The British Journal of Photography.

Mercury—Its Use in Photography

The metal mercury, in its elementary or natural state, has no direct use in photography today, although it did in the days of the Daguerreotype.

One of the salts of mercury is used to a considerable extent in photography at the present time, namely, the bichloride. In chemistry the word (hydrargyrum) is used to denote the metal mercury, hence the bichloride is always written in chemical symbols, the bichloride being $Hg\ Cl_2$, which means that two atoms of the gas chlorine combined with one atom of mercury to form the salt.

Bichloride of mercury, as is fairly well known, is a very poisonous chemical, acting upon the human system disastrously, there having been in recent years abundant proof of this.

In photography this salt is used for what is called a bleaching agent, the object being to cause a silver image to become invisible by the salt of mercury combining with the silver in the gelatine film. So although the image becomes invisible, it still exists and may at any time be made visible by submitting the bleached print to the action of a mild alkali, or to the action of hyposulphite of soda in particular.

A strong solution of bichloride of mercury is used by many artists for bleaching a print upon plain silver paper, after the desired parts of the photograph have been drawn in with a black waterproof ink. The inked-in picture may then be re-photographed to produce suitable negatives for line work of the photo-engraver. There are also many made-up photographic preparations today that contain a salt of mercury for the intensification of negatives. All these preparations, no matter of what kind, should be handled with much care, and kept away from any cut or abrasion of the skin, because sores may be formed that are difficult to heal, and the poison may enter the system, in which case the symptoms of mercurial poisoning would quickly develop.

There are two chlorides of mercury, the one in question and the other a subchloride known as calomel, a preparation largely used in medicine, particularly in the making of pill masses for disorders of the liver and sometimes in the form of candy lozenge.

It was from the red oxide of mercury that Priestly discovered oxygen or vital air, as he very aptly termed it. While Lavoiser gave the name of oxygen to the gas, and employed the same chemical as Priestly fully a year after Priestly's discovery.

In the intensification of gelatine negatives the white film brought about by bleaching consists principally of calomel formed by an interchange in chemical action, and it is this salt that becomes blackened by the addition of a weak solution of ammonia, or into a sulphide of mercury by the use of a strong solution of sulphite of soda.

The nitrate of mercury is used in silver plating establishments as a dip for articles of brass, German silver and copper to secure a chemically clean surface.

This latter salt is also used to prepare the sulphocyanide of mercury often seen in what is known as Pharaoh's serpents. When mercury is combined with sulphur, from chemical solutions, a black sulphide is formed, which, when carefully heated, changes to vermilion or artificial cinnabar. Although mercury is found in Nature, it is also obtained by distilling the natural cinnabar, which is the natural sulphide of mercury. Vermillion of the brightest description is sometimes made by placing flowers of sulphur and mercury in a couple of iron bottles and attaching these to the rim of a flywheel of a stationary steam engine, where, after several weeks' rotating, the sulphur and mercury combine, being converted into vermillion, while scarlet vermillion is produced by the addition of a solution of iodide of potassium to a solution of bichloride of mercury. The intense scarlet precipitate when washed, filtered and dried forms the scarlet vermillion of commerce. When ammonia is added to a solution of bichloride of mercury a precipitate is formed which is known as white precipitate, which is used largely by both the chemist and physician.

ARTIFICIAL *VS.* NATURAL LIGHT IN THE STUDIO

E. LEAVENWORTH ELLIOTT

The daylight studio is passing. To the next generation it will be only a matter of history, taking its place with the Daguerreotype, the collodion plate, the silver chloride print, and the "tintype" as a marker along the path of photographic progress. The advantages of electric light over daylight are so many and so obvious as to leave no doubt in regard to the final outcome. A mere enumeration is sufficient; electric light is invariable in visual and actinic intensity; unlimited in its adaptability as to direction, diffusion, and concentration of illumination; does not require a specially located and constructed room for the studio; makes every hour of the twenty-four equally available for sittings; and, taking the operator's time and chances of failure into account, is cheaper than natural light.

The transition from the skylight to electric light is characterized by the same general incidents that marked the early days of the dry plate. It was taken up skeptically and casually at first, and many of those who adopted it on account of its greater convenience lamented the fact that they could not get the results that were possible with "the good old collodion plate." And they were right, from their own personal standpoint; until they had mastered the technique of dry plate manipulation their results were naturally inferior to those obtained by the processes with which they had been so long familiar. Also, the dry plates were much more expensive than the home made collodion plate. And to complete the similarity, when the dry plate had so far established itself that its manufacture became a commercial possibility, brands that varied from bad to worse at once appeared, among those which exemplified the real merits of the process.

When the late Peter Cooper Hewitt first brought out his mercury vapor lamp, the abundance of blue and violet light which it produced at once suggested its use in photography. At that time—some twenty years ago—the idea of taking photographs by artificial light was so startling as to place it in the category of scientific curiosities. This element of novelty, combined with its demonstrated utility for the purpose, was soon exploited for the production of small portraits which could be delivered "while you wait," and sold at a price that put them on a par with the late lamented "tintype." And so the "post card photo" came to fill this want which the demise of the tintype had left unsupplied. This is a perfectly legitimate field of portrait photography, and one which will be cultivated so long as the demand, and a means of meeting it, continue to exist.

From this small beginning it was only a matter of development to adapt this new source of light to all the requirements of the most ambitious and talented artists of the profession. And yet, there are some who still associate the Cooper Hewitt Lamp only with the "post card photo." The history of the phonograph furnishes a somewhat similar case. When first put upon the market it was a scientific toy, a mysterious contrivance that could so closely imitate the human voice as to actually deceive a dog! Time went on, and one day it was announced that Caruso was singing for the phonograph. From that moment it took its place among serious musical instruments. To speak of Cooper Hewitt light today as "only a post card proposition," shows as little comprehension of its actual position in the art as it would to speak of the phonograph as only a toy fit for the amusement of dogs and children.

This light has been used these many years in the studios of those who stand at the very top in their profession, and has become standard equipment in that most intricate and highly developed branch of the photographic art, the production of the motion picture. In fact, the moving picture studio has demonstrated that electric light is capable of producing such a variety of striking and artistic effects as was never dreamed of in the days of daylight photography. Anyone having a lingering notion that electric light is only a makeshift substitute for sunlight will have his doubts dispelled for all time by witnessing any of the present day screen productions.

There is but one thing needful for the full realization of all of the advantages of electric light in the studio, which has already been intimated in referring to the advent of the dry plate; the *technique* of artificial lighting must be mastered. When this has been accomplished a higher quality of work can be developed and consistently maintained than is possible with natural light.

All technique is founded upon a basis of scientific facts. "Any problem can be solved if we have the facts," says Mr. Hoover, and he has certainly shown a sufficient number of brilliant examples in his own work to prove his point. Let us then assemble the facts relating to the problem in hand.

Of first importance is the fact that the eye and the photographic plate differ widely in their sensitiveness to the different kinds of rays which are contained in sunlight and in

the familiar forms of artificial light. As we all know, such light contains all the different pure colors—red, orange, yellow, green, blue and violet, with their intervening blends. The light at about the middle of this series, the yellow and yellow-green, is the most effective in producing the sensation of vision; whereas the rays near the end, the blue and violet, are the only kind that effect the ordinary plate. By special processes, plates are now made that are sensitive into the green, which are commonly designated as "orthochromatic;" and still others are made which are sensitive to the whole series of colors, and are classed as "panchromatic." The second and third of these three types do not, at present, figure largely in the regular work of the portrait studio.

In considering any given source of artificial light, then, the first fact to be ascertained is the relative power of the visual, and the photographic, or actinic, rays which it emits. This having been established, there remains to be considered the items of convenience, adaptability, cost of production, fire hazard and the general effect of the illumination.

A very complete and careful comparison of the visual and actinic values of all the different artificial light-sources was made by Messrs. L. A. Jones, M. B. Hodges, and Kenneth Huse and the results reported in the *Transactions of the Illuminating Engineering Society*, in 1915, (Vol. X, p. 963). That their work was done in the laboratories of the Eastman Kodak Co., is a sufficient guarantee of its scientific accuracy and reliability.

There are two methods of giving the actinic value of a light-source; one by comparing the amounts of visual and actinic rays, and the other by giving the amount of actinic rays produced by a given amount of electric current. Both of these have to be taken into consideration in the choice of an artificial light for the studio. We, therefore, give the following table of values, taken from the report cited:

	Ordinary Plate		Orthochromatic Plate	
Light Source	Visual	Physical	Visual	Physical
Sun	100	100	100	100
Carbon arc white flame	257	52	234	45
Nitrogen Lamp clear bulb	64	8.9	68	9.8
Nitrogen Lamp blue bulb	108	7.8	99	7.3
Cooper Hewitt mercury vapor	316	47	354	54

As will be seen, the values have been reduced to a scale in which sunlight (direct rays) is taken as 100. The visual values represent the amount of actinic rays present when the light produces the same visual brightness, or intensity, on a pure white surface. The physical values give the amounts of actinic rays produced from equal amounts of energy, as electric current.

In the issue of *The Photographic Journal of America* for March there is an article by Messrs. Walsh and Buckley, in which a portion of the above table is given, followed by certain comments which need further explanation. As the point they argue is an important one, it will be worth while to consider it somewhat at length. They say:—

"At the same time it cannot be assumed that objects illuminated by the mercury vapor lamp will give three times the effect on the plate as those illuminated to the same degree (measured visually) by an electric arc, for the effect on the plate is the result of actinic *brightness* of the object, not its illumination *per se;* and as the reflection ratio of most surfaces varies with the wave-length of the light they receive, it follows that an object which reflects only red light may appear actually brighter (photographically) than a blue object when both are illuminated by light very rich in red rays."

In order to get at the bottom of this argument it will be necessary to keep very clearly in mind the exact meanings of the terms "brightness" and "illumination," as used in scientific language. *Brightness* is the intensity of the visual impression, and is therefore proportional to the intensity of light *reflected by* the object; while *illumination* is proportional to the intensity of light that *falls upon* the object. By analogy, we may speak of "*actinic brightness*," which depends upon the intensity of actinic rays reflected from an object, and of "*actinic illumination*," which depends upon the intensity of actinic rays falling upon the object.

Now let us suppose that we have two sources of light, and we arrange them so that they produce the same visual brightness on a given white surface; then the surface is equally *illuminated* by the two light-sources, for this is the way illumination is measured. Now let us suppose that photographic plates are exposed in the position of the white surface for equal lengths of time, to the two different kinds of light, and developed under exactly similar conditions; the photographic effects of the two lights will be proportional to the densities of the negatives. This is the method used, in general terms, by which the values given in the table were obtained.

It follows from this that objects *illuminated* to the same degree—that is—receiving the same amounts of light measured visually, must have degrees of

actinic illumination corresponding to the values given for the different kinds of light. In other words, the table gives the relative values of *actinic* illumination for equal *visual* illumination.

Now suppose that a given surface receives the same intensity of visual illumination from mercury vapor light, and tungsten light; the actinic illumination from the mercury vapor light will be five times as intense (see table) as the actinic illumination from the tungsten lamp. And since the surface reflects a certain amount of the actinic rays, the *proportion*, or percentage, of reflection being always the same for the same surface, the amount of actinic rays reflected, *i.e.*, its actinic brightness, will be five times as great under the mercury vapor light as under tungsten light; and this will be true regardless of the color of the surface.

The authors quoted have themselves become confused in the distinction between brightness and illumination; as we can readily show. Thus, suppose that equal amounts of mercury vapor and tungsten light, measured visually, fall upon a red surface. Since mercury vapor light contains no red rays, the surface will have a low visual *brightness*, *i.e.*, it will appear dark under this light because it is a poor reflector of the other color rays which mercury vapor light contains; but its *actinic* brightness will still be five times as great as under tungsten light. The ratio of actinic to visual *brightness* under the two kinds of light will therefore vary with the color of the surface. For example, surfaces having much red will look darker under mercury vapor light; and to bring them up to the same visual brightness will require a relatively large total amount of light, thus increasing the ratio of actinic to visual brightness. Since mercury vapor light is much richer in blue and violet than tungsten light, surfaces on which these colors predominate will have a correspondingly lower ratio of actinic to visual brightness as compared to tungsten light, because it will not take as much mercury vapor light to produce a given visual brightness. The two kinds of light are both rich in yellow rays, so that with yellow surfaces the ratio of actinic to visual brightness will be about the same as with white surfaces.

In photography the lighting for the most part is judged by the visual brightness of the face. The predominant colors in the face are yellow and red, the green and blue being relatively very weak. It follows from the explanation just given that the ratio of actinic to visual brightness of a face under mercury vapor light must be greater rather than less than five to one of tungsten light. This is counter-balanced to some extent by the fact that the yellow in mercury vapor light is somewhat stronger than in tungsten light. Those who have made experiments in their own studios agree very generally in putting mercury vapor light at five times the actinic value of tungsten light, which checks up with the result of the scientific tests.

While on this subject one peculiar and very common fallacy in regard to the color of light may be noted: viz, the idea that color can be *put into* light by passing it through colored glass. The blue bulb tungsten lamp is a curious example of this fallacy. A little study of the difference between the cause of color in *light*, and color in *objects* will make the matter clear. Color in light is inherent, and unchangeable, being the visual effect of the wave-length of the rays. The color of an object is incidental and variable, and depends upon its ability to *destroy* color-rays. This applies to both opaque and transparent substances. A blue object is one that has destroyed, by conversion into heat, the larger part of the green, yellow and red color-rays that have fallen upon it. Blue glass destroys the yellow and red rays to a certain extent, thus increasing the *proportional* amount of blue rays in the light that passes through. But the coloring matter in the glass destroys some of the blue rays also; so that the lamp with the blue bulb is actually less efficient, photographically, than the clear bulb lamp. This is shown by the values given in the table, the physical efficiency of the blue bulb being 7.8, against 8.9 for the clear bulb, or a reduction of practically 10%. While the blue bulb reduces the physical efficiency, it brings the ratio of actinic to visual brightness nearer that of daylight, which may justify its use.

In point of physical efficiency, which must be considered in computing the comparative costs, the white flame carbon arc is about 10% better than the Cooper Hewitt Mercury Vapor Lamp.

We have now to consider the three sources of light with reference to the other items constituting the general problem. Taking them up in the order given, we have first:

Convenience. This refers to the time and attention required to keep the lamps in good working order. On this score the mercury vapor and tungsten lamps are about on a parity. The mercury vapor tubes last much longer than the tungsten bulbs—from five to ten times as long on the average; but the labor of replacement in either case is a small matter in the relatively few lamps used in the studio. The arc lamp is decidedly at a disadvantage in this respect. The carbons must be replaced at frequent intervals, and the reflecting devices cleaned of the scattered carbon dust and ashes.

Adaptability. Under this heading we have to consider the accessory apparatus required to convert the *light* produced by the lamp into the *illumination* desired on the subject. When we remember that the sky- and side-light may easily contain fifty square yards of light-giving surface, and that at most an electric lamp has only as many square inches, the problem of securing the requisite diffusion with artificial light seems to offer great, if not insuperable difficulties. But they are not as great as they at first seem. In the first place, such an expanse of light-source is not at all necessary, other conditions being met. In fact, a more or less elaborate system of curtaining was a necessary adjunct to the old-time sky-light, whereby the general diffusion could be reduced, and the direction of the predominant light sufficiently defined. This great expanse of glazed roof and wall, which was a necessity with the "wet plate" in order to reduce the time of exposure as much as possible, has survived as a sort of tradition long after this reason for its existence has vanished. That this traditional volume of light is by no means necessary in order to produce all the various effects of lighting requisite for the highest expression of art in portrait photography, is shown by experience. Probably the best known portraitist in this country has, for years, used no other light than six mercury vapor tubes, arranged parallel in a frame which is rigidly fixed to the ceiling and side wall of his studio, which is an ordinary room in an office building. In size, this represents a window four feet square. A floor screen and a small hand screen, either white or black, do the rest.

In the second place, the mobility of the electric lamp has opened up a whole new field of lighting effects. Daylight is always an overhead light, completely diffused; electric light may come from any direction, and be as concentrated or diffused as the operator wishes. Combinations of diffused and concentrated light are capable of an infinite variety of effects, from mere artistic accentuation to the bizarre and grotesque.

A certain volume of evenly diffused light is an absolutely essential basis in all studio lighting. For this purpose the mercury vapor lamp, from the nature of its construction, has no equal. The luminous surface is a tube four feet long and one inch in diameter, and is of such mild brilliancy that the eye can look straight at it without being in the least dazzled. At the same time the light is more powerful photographically than the light from the dazzling arc, and many times more powerful than the light of the tungsten bulbs. There is thus no necessity of any diffusing screens, with their attendant large loss of light, the small white reflector to which the tube is regularly placed furnishing all the accessory apparatus required. The tubes will operate in any position from the horizontal to the vertical, and can be supported on movable floor stands, attached to side walls, or suspended from the ceiling.

When there is a lamp available, the inherent features of which so admirably lend themselves to the requirements of this particular field, the lay observer is lead to ask, "Why take needless trouble to overcome the inherent difficulties of other light-sources?" In the March issue of *The Photographic Journal* besides the article to which we have already referred, there is another by Mr. Leon Gaster on *"The Selection and Use of Illuminants for Studios,"* in which some suggestions are made for meet'ng the shortcomings of incandescent lamps, which would seem to be more ingenious than practical. "I understand," he says, "that in some forms of studio lighting using gas filled lamps, the light is reflected from a lilac-tinted surface, whereby the impression of brightness on the eye of the subject is much diminished, but the photographic effect is scarcely effected." But such a procedure would absorb at least thirty per cent of the blue and violet rays and reduce the photographic efficiency by that amount. Why not use a light-source that is free from the orange and red rays to begin with? He further suggests, since the great majority of artificial illuminants give the larger part of their radiation from the infra-red to the yellow, that plates be made that are sensitive to these radiations instead of to the blue and violet. Again we may ask, Why all this effort to reverse the present methods, on whose development years of time have been spent, when it can all be avoided by a mere choice of light-sources? It is reported that a scientist has actually succeeded in making what passes for a silken purse out of the material found in a sow's ear; but so long as the product of the silk worm is available, the makers of silk purses are little likely to become enthusiastic over this scientific stunt. Efficiency in the commercial production of wares, whether objects of art or articles of utility, is the result of adapting the means to the end with the least outlay of time and money.

For the superimposed, concentrated light—in general terms—the spot-light, the arc and incandescents are, of course, the sources to be used; the former for mass composition, as in moving picture work, the latter for the individual work of portraiture.

Cost of Production. The cost of producing light to replace daylight includes the

interest and depreciation on the investment in lamps and accessories; the cost of the electric current; cost of renewable parts; and general maintenance, repairs, cleaning, etc. The amount of the first investment is very small as compared to the cost of constructing a skylight. But where the skylight is already in, electric equipment means extra outlay. There is the great advantage that electric light makes any store, or office room, available as a studio —"but that is another story."

It is possible to take perfectly good portraits with a single Cooper Hewitt Lamp, costing about fifty dollars, or, if mounted on a movable stand, seventy-five to eighty-five dollars. Two such outfits furnish a fairly good equipment for the average studio; and four to six tubes are ample for the largest group work. The permanent parts—everything but the tubes themselves—will last indefinitely under decent usage, but may be charged off at 10% a year in deference to business custom. The tubes, which last from 3,000 to 10,000 hours of actual burning, cost fifteen dollars each. At a ten-cent rate for current, it costs four cents an hour per tube. While it is impossible to make exact estimates, it is apparent that the total cost of electric light is much more than offset by the time lost and failures made with natural light. It is somewhere near the truth to place the cost of electric light at one cent for each plate exposed—if you must have an actual figure. As will be seen from the table, the cost of current for tungsten lamps will be from five to ten times as much as for mercury vapor lamps, according to the means used for directing and diffusing the light. While the white flame arc would be a little more efficient than the mercury vapor lamp, if all its light could be utilized, the loss resulting from its diffusion will reduce its efficiency to something below this point.

For general lighting, then, the Cooper Hewitt lamp stands in a class by itself in respect to both efficiency and adaptability.

General Effects. Under this head we may consider the lighting of the studio as a room, apart from the special lighting of the subject. With daylight the two are one and the same; but with electric light they may be two quite separate things. This is particularly true where the mercury vapor lamp is used for the photographic lighting; its peculiar effect upon the complexion, giving the yellow hues a greenish tone and the reds a livid purple, is startling and unpleasant to those unaccustomed to seeing it. It is therefore generally considered necessary to avoid this disagreeable effect by using a small proportion of light that is rich in orange and red. For this purpose the vacuum (small size) tungsten lamp, or better still, the old-fashioned carbon filament lamp, exactly fills the bill. It is surprising how little light of this quality is required to effectually remove all the disagreeableness of the mercury vapor light—so little, in fact, as to make a scarcely appreciable difference in the general lighting effect on the subject. Such lamps may be installed permanently as for room lighting, although some prefer to place them with the mercury vapor tubes.

The question of general effect should not be concluded without a short discussion of the imagined danger of injury to the eyes by the ultra-violet rays that are supposed to lurk in mercury vapor light. This matter can be quickly disposed of. The fact that the light of the Cooper Hewitt Lamp contains less ultra-violet rays than direct sunlight is alone a sufficient answer to this whole question. But to make assurance doubly sure, it may be stated that the experience of those subjected to the strongest light of this kind, the actors in the cinema studios, has shown it to be entirely harmless. Some of the "stars," who are in a position to dictate conditions, refuse to act under any other form of artificial lighting. And, to put a final clinch on the proofs, the question has recently been exhaustively investigated by thoroughly competent scientists, whose conclusions are entirely in accord with the facts derived from general experience. It is to be hoped, therefore, that this bogey of the ultra-violet light has been laid for all time. So far as mercury vapor light is concerned, it is, by reason of the entire absence of glare, the easiest on the eyes of all forms of electric light.

Still one other item remains for consideration under this head, and that is steadiness and quietness of operation of the lamps used. The arc is the only offender on this score, the hissing, popping and spluttering, to which this form of lamp is subject, and the consequent wavering and flickering of the light, are serious matters in the studio, where the sudden diversion of the subject's attention may be fatal to the sitting.

The arc also introduces a fire hazard that may be more or less serious.

Summary:—A study of the question of natural *vs.* artificial lighting brings us to the following conclusions:

Artificial lighting not only affords a means of producing all the lighting effects possible with natural light, but opens up a whole new field of effects that are impossible with natural light alone.

Considering the independence of weather conditions, as well as of night and day and the elimination of wrong exposures, artificial light is cheaper than daylight.

For the general illumination of the

subjects, Cooper Hewitt light is preferable on account of its high actinic quality, easy adaption to the purpose required and freedom from glare.

For special illumination—spotlighting—the arc is superior for mass effects and the nitrogen tungsten for the single subject.

Lightening Dark Prints

Even the most careful workers occasionally get prints which are more or less overdone either in exposure or development, and when juvenile assistance is employed, the proportion of such prints is sometimes rather too large to allow them to be thrown away. With developing papers there is often a variation in the speed of different batches which causes, perhaps, quite a number of prints to be too dark to send out, and it is, therefore, highly desirable that a reliable and clean working reducer should always be kept ready to hand.

Fortunately, in the case of bromide and gaslight papers, the image is practically composed of metallic silver, a portion of which can be easily dissolved without any appreciable alteration in the color of the remainder, and for this purpose there is nothing better than a solution of iodine mixed with cyanide of potassium. This should be prepared as follows:

A. Ten per cent. solution of iodine in iodide of potassium.

B. Ten per cent. solution of pure cyanide of potassium. For use, take:

A solution	30 drops
B solution	10 drops
Water	2 oz.

This is one of the most useful solutions for the reduction and cleaning up of bromide and other developed prints which can be imagined, for not only is it suitable for general reduction, but also for locally lightening any parts which may require it for cleaning up dirty edges, removing abrasion markings, and even for correcting faulty vignettes or turning a solid picture into a vignetted one. For local application it should be much diluted and applied to the surface, which must previously be well soaked in water with a pad of cotton wool. Thorough washing must, of course, follow the use of this reducer. It must be borne in mind that the stock solutions are both extremely poisonous.

Another somewhat similar solution which dispenses with the poisonous cyanide is made thus:

Potassium iodide	30 grains
Iodine	3 grains
Water	10 oz.

The print is immersed in this until it assumes a uniformly blue tint on both sides, then rinsed and placed in a plain 10 per cent. solution of hypo for five minutes and washed as after fixing. This treatment tends to increase contrast, and is invaluable when only heavy flat prints are obtainable from thin overexposed negatives. It is also good for cleaning off a general fog. If upon drying, the print still appears too dark, the treatment must be repeated. I have not found this method suitable for local application.

At a pinch, the ordinary ferricyanide and hypo reducer may be used, but there is always a danger of yellow stains, and unless very dilute the action is liable to be too rapid and uneven. Persulphate of ammonia may also be used, but has a tendency to give a rather rusty color to the finished print.

Printing-out papers, either those which require toning or the self-toning variety, require somewhat different treatment, as the image (not being entirely composed of metallic silver) is much more delicate in its character and is liable either to vanish entirely or to lose the greater part of the half-tones unless very dilute solutions are used. The following solution has been found to give good results:

Hypo	1 oz.
Water	50 oz.

Immediately before use add to each ounce required 10 minims of a 10 per cent. solution of potassium cyanide. When the print is sufficiently reduced, the action is at once stopped by immersion in a 10 per cent. solution of acetic acid.

A solution which is also applicable to self-toning papers is:

Uranium nitrate	3 grains
Hypo	120 grains
Water	2 oz.

This is used after the ordinary toning and fixing, and does not perceptibly alter the tone or gradation. It is rapid in action, rarely requiring more than a minute or two, although very deep prints may require longer.

When the over-printing is not excessive, an intermediate bath before toning will often give excellent results. For this purpose they may be immersed after well washing in a weak solution of ammonia,

one dram to the pint, and then again washed before toning. The prints must be kept in motion while in the ammonia or the action will be uneven.

Immersion in a strong solution of common salt before toning has been recommended, and judging from its action on albumenized prints should be equally effective with gelatine.

Although I have not personally tested it, I know several skilled printers who employ Haddon's reducer for all classes of prints and assert that it is superior to all others.

Potassium ferricyanide	10 grains
Ammonium sulphocyanide ..	20 grains
Water	2 oz.

This may be diluted with an equal bulk or more of water, or the action is likely to be too energetic.

A very weak persulphate solution containing 5 to 10 grains to the ounce of water may be employed upon toned and fixed prints, the action being stopped. With a 10 per cent. sulphite solution as usual, care must be taken that the print is thoroughly free from hypo.

In some cases upon matt-surfaced papers mechanical reduction may be resorted to where only the high lights require cleaning up, and for this purpose a very fine ink eraser, free from grit, may be used. If the print is bone dry, the deposit may rapidly and safely be reduced without showing marks. If the surface is at all uneven, it may be improved by well wetting it all over, when it should dry uniformly. Finely powdered pumice from the artists' colormen is also excellent for general lightening up. It is best applied with the finger and gently rubbed on; both finger and print must, of course, be quite dry. The dry method is, of course, the only one applicable to carbon prints, which can be quickly cleared of tints in this way, and even platinum prints are more or less amenable to it, although, as the paper is practically unsized after the acid baths, great care must be taken not to rub up the surface.—*Practicus in The British Journal of Photography.*

The Bulletin of the French Society of Photography states that if the sensitive material of the blue-print is coated upon a gelatine layer, instead of directly on the paper, a better gradation of the impression is obtained. The gelatin-coated paper prepared for the double transfer pigment process may be used.

Glycin as a Developer

Le Bail in *Photo-Revue* gives at some length his experience with this well-known substance. He acknowledges a strong attachment to pyro, which he uses not only for plates, but for bromide work, obtaining with the latter excellent results, in spite of reports to the contrary. He has, however, found glycin to have great advantages, especially when slow development is practiced.

Glycin is a flexible, energetic agent, not producing fog and forming a fine grained silver film. It is practically not oxidizable in the air, which permits one to pass a number of plates through the same bath, without any perceptible variation in contrast or detail. On account of its flexibility, the mixture containing it may be made up in one or two solutions, and it has the property of being very little influenced by the modifications in the quantity used, and differs from some other developers in requiring only two or three times its weight of sulphite. Notwithstanding these qualities, the substance has been but little employed, being found only in the laboratories of a few enterprising amateurs. Le Bail, however, is not writing for these, but for the mass of beginners who are in the habit of using ready-prepared developers.

The most important point is that the glycin should be of high purity. The solution of it should be only of a very pale yellow; in this condition it keeps well, especially if the solution is rather concentrated. The following formula is recommended:

Water ....100 c. c.		3 fl. oz.
Sodium sulphite, dry	1.5 grams	20 grains
Glycin	1.0 gram	15 grains
Sodium carbonate, dry	3.0 grams	45 grains
Potassium carbonate	2.0 grams	30 grains

For use, take one volume of this solution and one volume of water. Ten drops of a 10% solution of potassium bromide should be added. The temperature should not be below about 65° Fahr., but not appreciably above this, as the bath is then liable to yield flat negatives. Theoretically, the bromide may seem unnecessary, as there is no danger of oxidation; the author favors it as it seems to keep the shadows clear, and to moderate the action of the developer. It is necessary to dissolve the substances in the order given, especially as

glycin is but feebly soluble in pure water. It is, indeed, an advantage if the water is lukewarm. The developer may be used for transparencies and papers, but with these a more liberal addition of bromide should be made. For tank development, the above solution should be diluted to 1500 to 2000 c. c. (3 to 4 pints). The tank development is especially satisfactory, if the negatives have received the proper exposure, and they will acquire the proper development in about an hour, but it must be borne in mind that negatives developed by the slow method fade slightly in fixing.

For those who prefer to prepare the developer in two portions the following formulas are given:

A

Water	100 c. c.	3 fl. oz.
Sodium sulphite, dry	1.5 grams	20 grains
Glycin	1.0 gram	15 grains

B

Water	100 c. c.	3 fl. oz.
Sodium carbonate, dry	10 grams	150 grains
Potassium carbonate	10 grams	150 grains

For use take 5 volumes of A, 1 volume of B and 6 volumes of water. With over-exposures, it is preferable to use 5 volumes of solution A, 6 volumes of water and a small amount of B. The plate is then immersed and after two minutes small quantities of B are added from time to time until complete development has been reached. Very satisfactory results can be obtained by this means on over-exposed plates.

Combined Toning and Fixing Baths

The use of a combined toning and fixing bath is not generally recommended, because, in the past, prints that have been toned in some complicated preparation have changed color and almost disappeared. In many instances the picture has entirely disappeared. Such preparations as these must be avoided, but there are several toning and fixing compounds that produce tones of a very rich color and do not fade. Such a bath as this is useful at times when a rush order is in hand, the prints having to be gotten out quickly.

The first toning baths that were employed in the early 50's were all combined baths. The hyposulphite of soda had to be taken great care of, and its properties utilized to the limit, because of the high price which had to be paid for it. Just imagine a dealer today asking six cents an ounce for hyposulphite of soda. Such was the price paid for hypo at that period. In 1851 the price for this article was sold at 84 cents per pound, and again in 1854 the price fell to 32 cents per pound. Even then 4 cents per ounce was charged for it, while today the price is 5 cents per pound by the single pound, or 2 cents by the 100 pounds. So a more liberal use of this necessary chemical is permissible today. In nearly all the toning and fixing baths the use of sulphocyanide of ammonium comes in. That the use of very hot water is essential in preparing a bath of this description, for the reason that chemical combinations are formed more completely by the aid of heat, and for that reason the formulæ given here calls for water heated to 180 degrees Fahr. and kept at this temperature during the dissolving of the salts, after which they must be allowed to become quite cold before adding the solution of gold.

COMBINED GOLD TONING BATH.

A.

Distilled water, at 180 Fahr.	10	fl. oz.
Acetate of soda	2	dr.
Sulphocyanide of ammonium	2	dr.
Hyposulphite of soda	2½	oz.

B.

Chloride of gold	5	gr.
Distilled water	1	oz.

When A becomes quite cold B may be added to it, stirred well with a glass rod, for use, take 1 part to 10 parts water.

The best way to prepare this solution is to make it at night. Then in the morning the gold may be added.

FORMULA FOR COMBINED BATH, NO. 2.

A.

Hot distilled water	48	oz.
Phosphate of soda	120	gr.
Sulphocyanide of ammonium	200	gr.
Hyposulphite of soda	4½	oz.

B.

Distilled water	8	oz.
Chloride of gold	8	gr.

Add B to A when cold, for use take 1 part to 10 parts water.

Although many combined baths have been the means of practically ruining thousands of prints, the above formulæ are among the best, and may be used for producing very good results, the first one in particular.

Genesis of the Picture

There are rules of art which everyone aspiring to study the principles upon which the pictorial depends must know and appreciate, but the qualities which go to make up the picture cannot be had by following any set formula. You cannot inject art in a photograph by any mechanical process. You must first have the art in yourself before you can express it in the terms of art, and do not imagine that the pictorial is expressed by conforming to any particular art cult.

Of course, the impressionist has a legitimate right to employ whatever consistent means available to give expression to his sentiment, just as the painter has. The main object in any pictorial performance is to create in the mind of the spectator that motive or conception which the artist had at the moment he conceived it, and so anything which aids him supremely in this direction should be employed. But if he is possessed more with the desire to convey his impression than with the intent to merely surprise or astonish, he will prefer rather to wrestle with those factors which constrain to legitimate lines of action; that is, to bring the composition in harmony with time-honored and established rules of art.

It is the evidence of the conquered difficulties which really gives the impression of surprise which produces interest. The unexpected gives us the feeling for the poets' or painters' power.

To give a realistic idea, the greatness of the impression is in proportion to the unexpectedness of the result just as we cannot help marveling at the results from the explosion of a small piece of dynamite. The expectation is perpetually kept on the alert by the risks of the enterprise.

We most naturally ask ourselves how will the poet or painter give a good account of himself within the conditions imposed by art under this self-imposed despotism.

To draw upon a kindred art by way of example. The poet has imposed upon him the restriction of rhyme and metrical structure. If he wins out in the management of his supply of rhyme and the limitation of a certain number of poetic feet to the line, and presents his thought with unity, beauty and richness of expression without any sacrifice of sentiment and with the impression conveyed that his imposed conditions have not restrained him at all, is not our pleasure greatly increased and our enjoyment of the sentiment more enhanced than if he should break all the prescribed traces and disregard all the rules of art? The photographic artist who endeavors to give expression by those means which may be considered constraining influences, who seeks to overcome by legitimate action the impediments, really creates greater work and our appreciation is increased because of the victory.

Impressionism so considered, that is in its true and legitimate sense, where it is employed to give utterance to genuine artistic sentiment, is as much true art as the most minute mode of expression by the great painters of realism. But it savors of mere affectation and is evidence only of the lack of ability when the artist—unable to give any clear utterance to this thought, has recourse to tricks of sensational presentation.

The poet or painter is not an acrobat delivering stunts to please a puerile class of readers or spectators, and there is no cheap way of getting to a place in the temple of art. Mean trickery will not bribe the astute door-keeper. You must pay the price of admission to the select circle and this ticket must be countersigned by Earnest Effort and have honest motive, writ large.

Brown Prints and Others

The photographer is frequently in need of printing process—not necessarily for artistic exploitation, but primarily for record purposes. That is, for reproduction of plans, simple sketches and similar work where rich gradation is not particularly called for. The following method, which is a modification of the Kallitype process, devised by Mr. Brown, of England, will be found most satisfactory. Four solutions are prepared:

A

Ammonium ferric citrate (green salt)	110 gr.
Distilled water	1 oz.

B

Tartaric acid	16 gr.
Distilled Water	1 oz.

C

Silver nitrate	45 gr.
Distilled Water	1 oz.

D

Gelatine	30 gr.
Distilled Water	1 oz.

Take first the gelatine, let it swell up in a little of the water for half an hour, add the rest of the ounce of water and heat

until the gelatine dissolves. Use equal parts of A, B, C and D; say, one dram of each for immediate coating—as the paper works best freshly made. It will keep, however, for a week in a cool, dry place.

Take one part of A (gelatine solution), place in a beaker or glass, add an equal part of the iron solution (A), then an equal part of B (tartaric solution), and finally an equal part of C (silver solution). In adding the silver, drop in a few drops at a time while stirring and a good final stir.

To coat the paper, pin it to a board at the four corners, dip a wad of absorbent cotton in the mixture so that it is saturated with the liquid, and apply to the paper near the center of the sheet and spread the liquid evenly over the surface to the edges, then squeeze out the wad and use it in this state to blend the surface. Do the blending with light, even strokes. Dry in a warm room. When thoroughly dry, it may be used immediately. Print under negative to get a rather strong image. Develop in plain water. The image comes up reddish-brown in color, but turns a deep brown in the fixing solution, which is composed of

Hypo	80 gr.
Water	8 oz.

Ten minutes is sufficient fixation. The image reduces a little in the hypo. Finally wash well.

The usual method upon blue print paper is unsatisfactory on account of the lines of the subject being in white upon a deep blue ground, objectionable when any correction to the copy is desired.

Dark lines upon a white ground are much more satisfactory. The most approved plan for making direct positives from tracings, drawings, etc., is the following:

SENSITIZING SOLUTION

A

Gum arabic	13 dr.
Water	17 oz.

B

Tartaric acid	13 dr.
Water	7 oz.

C

Persulphate iron	8 dr.
Water	6 oz.

Make these up separately as stock solutions. To prepare the paper, use equal parts; pour C gradually into B and stir well, and then pour the combined B and C into A, stirring again well. When mixture is complete, add very slowly (with stirring) an equal portion of a solution of ferric chloride (perchloride of iron) Sp. g. 45°. Filter before use.

Coat the paper as directed for brown prints (see above). Dry rapidly near a fire, but do not let the heat be over 150° (in the dark, of course). Print in the usual way. The parts not under the lines of the tracing, bleach on exposure to sun, and you have faint yellow lines on a white ground. Print sufficiently to get the exposed part bleached, otherwise the ground will be faintly tinted. Electric light may be used, but strong sunlight is preferable. Do not over-print, or the lines suffer in intensity.

DEVELOPMENT

Float for a couple of minutes, taking care to avoid air bells or getting developer on the back of the print, in the following:

Gallic acid	32 gr.
Oxalic acid	1 gr.
Water	32 oz.

The yellow lines change to black. Transfer to a weak acid bath (one part hydrochloric acid to eighty parts water). Finally wash well and dry.

Intensification

The following method, which was originally formulated by our Mr. John Bartlett, can be depended upon to give certain and satisfactory results in every case.

The details are as follows:

The negative (film or glass) should, after fixation, be thoroughly washed and then dried. The dry negative is then placed in a suitable dish, film side up, covered with clean water, the face swabbed over thoroughly with a tuft of absorbent cotton to remove air bubbles, allowed to soak for a few minutes, and then the water poured off, and sufficient of the following poured on to cover the plate. The solution is composed of:

Citric acid	60 gr.
Perchloride iron (dry)	60 gr.
Water	1 pint

This is kept in constant agitation over the plate for about a minute and then returned to its bottle, and the plate washed under a running stream of water for about five minutes. This solution can be used repeatedly for a long time before becoming exhausted. Its use is twofold: it tends to remove any thin film of fog upon the surface of the negative, and also furnishes a groundwork for the subsequent deposit of

mercury. The plate is now bleached by being placed in the following solution:

Mercury bichloride	½ oz.
Common salt	½ oz.
Water	1 pint

The plate must be frequently rocked while in this solution, and allowed to remain in it until sufficiently bleached. This is regulated by the amount of intensification required. If considerable density is desired, it must be allowed to remain until quite white. This solution is then to be poured off, and can be either thrown away or used for several more plates; the best results are obtained, however, by using fresh solution for each negative. The plate is next covered with a sufficient quantity of the following solution:

Common salt	2 oz.
Water	2 pints

This is allowed to remain on the plate for about a minute, then poured off and thrown away, and the plate well washed under the tap for about five minutes. The object of the salt is simply to dissolve out any mercuric chloride remaining in the film, and prevent the clear portions of the negative from becoming clogged up with any reduced mercury in the next operation. The plate is now returned to the dish, and a sufficient quantity of the darkening solution poured on it to just cover it. This is made as follows:

Sodium sulphite (cryst.)	3 oz.
Acid sulphuric (conc.)	½ dr.
Water	1 pint

The sulphite is dissolved in the 12 oz. of water, and then the acid previously mixed with the 4 oz. water added and allowed to cool. I should say just here to those not familiar with chemical manipulation that in mixing sulphuric acid and water the acid should be poured gently and in small quantities into the water, not the water added to the acid, as in the latter case, owing to the violence and heat of the combination, some of the acid might be thrown in the face of the operator.

As soon as the darkening solution is poured on the plate it commences to turn brown and then black. The operation is completed when the *back* of the plate is perfectly dark, showing no traces anywhere of the whiteness caused by the mercury. The negative should then be perfectly bright and clear, and of a brilliant bluish-black color. It is then to be placed under the tap, washed for five or ten minutes to free it from all traces of sulphite, swabbed off with a piece of cotton, and set up in a rack to drain and dry. The darkening solution can be used several times until it becomes exhausted, and is then thrown away. It should never be returned to the original stock bottle. This process can be depended upon to yield in every case good and satisfactory results, and the intensification produced is perfectly permanent in character. The main points to which attention must be directed in order to secure good results are these:

1. All solutions used must be filtered, clear and free from specks.
2. The negative must have been previously *well washed*, so as to *thoroughly remove all traces of hypo.*
3. The negative must be moistened before the solutions are poured on, so that they will act evenly and uniformly on the plate.

A negative can, if necessary, be intensified immediately after development, fixation and washing, without being allowed to dry, but in this case the density obtained will not be so great as if the plate had been previously dried.

The Photography of Projectiles

Ballistics is the technical term by which the science of projectiles is designated. Its application has been principally to warfare, and the use of ballistic apparatus dates back to the earliest period of the race, beginning with the javelin, the sling-shot, then the bow and arrow, and then taking the form of the stone and dart throwing engines of civilized nations. These machines had a very short range and the projectile a low velocity, so that the eye could follow the course, but the introduction of powder made a great change in the latter respect, and much attention has been given of late years to the character of the motion of high speed masses and to the effect upon the air. Measurements of velocity were easily made by the application of electrical devices, but the actual record of the projectile was possible only after the invention of high speed emulsions.

Interesting results have been obtained in recent years by the study of bullets and larger projectiles in rapid flight. F. Hauser, in *Zeit. Wiss. Phot.* has a long paper on the subject from which the following notes are taken:

The photography of projectiles serves several practical purposes and employs several different methods. The investigations do not cover merely the study of simple

unimpeded flight, but instantaneous pictures are taken of the effects of impact. Hauser's paper is, however, limited to a study of the effect that the moving mass has upon the air. Wounds made by bullets often show a damage beyond mere penetration, which earlier observers ascribed to a sort of explosive effect due to compressed air carried in by the projectile. Improvements in photographic methods have shown that what occurs is a condensation and rarefaction of the air and it is now possible to obtain clear pictures of these atmospheric changes. The exact effects depend, as might be expected, upon the velocity of the projectile. A very vivid picture, which accompanies Hauser's article, shows the bullet flanked by two long lines of air condensation centering at the apex and two similar lines centering at the other end. At very high velocity, a series of waves appear, extending in a straight line some distance back of the bullet. Ludwig Mach, who has made extensive investigations in this line, utilized as an illuminant, the electric spark, and obtained a striking and interesting series of pictures. The significance of these results has been examined from a mathematical point of view, a feature which is not opportune in this connection.

Most of the illustrations so far furnished in the journals and books are single pictures, but the motion picture camera will serve much better, though some mechanical modification may be required. It will be especially applicable for the studying of impacts and initial explosions, and indeed for the study of the forms of explosion.

A Protest Against the Exclusion of Foreign Technical Terms

Although probably of little interest to English-speaking photographers, yet a brief notice of an article by Ernesto Baum, the well known Italian photographer, recently published in *Deutsche Lichtbild Kunst*, will probably be worthwhile. For many years, German leaders have sought to exclude all use of words borrowed from other modern tongues. German is peculiar in its great facility for building up from its own shorter words, long terms that are perfectly intelligible to those that are familiar with the language. The title of the journal is an example of the practice, for the word "Lichtbild" is composed of two words meaning respectively "light" and "picture." Baum protests against such substitutions, arguing among other points that a very large number of terms are derived from the classical languages and, therefore, are readily understood by the educated in all lands, while the terms made up from the German have only a limited appreciation. He instances the German use of "Fernsprecher," that is, literally, "far speaker," instead of "telephone." The latter word in use is practically the same form by all other nations; why should Germans not use it also?

Stereoscopy of Fossil Insects

The insect world has probably not been preserved to us from earlier times in the abundance in which it doubtless existed. This is on account of the perishability of the mass of insects and the likelihood of their being devoured by the higher animals. Something is, however, known, though often through imperfect forms. The coal period was marked by the presence of dragon flies with a wing expansion in some cases of over a foot. One line of interesting preservations is that of the insects enclosed in amber. These are fairly common and the manner in which they have been immeshed is not always easy to determine.

At a meeting of the Antwerp section of the Belgian Photographic Society, Mr. Bastin gave some details of his trials to secure stereoscopic views of the insects thus immeshed. An abstract of the paper is given in *Photo-Revue*.

Amber is a fossil resin, assigned to the tertiary period, and has been discharged in a fluid condition from the trunks of cone-bearing trees. Any insects that may be caught in the soft material will, of course, remain in it without undergoing appreciable decomposition, and thus, after thousands of years, their forms are admirably preserved. To secure photographs the mass of amber containing them is cut into small blocks of a few millimeters in thickness (about one-eighth of an inch) and both sides well polished. Bastin's apparatus consists of a camera mounted on a swivel by which two views can be taken each from a different point on a horizontal line, thus imitating the ordinary double camera. As the objects are immovable, there is no hurry in the exposure. The illumination should be by electric lamps affording both transmitted and reflected light. The specimens shown at the meeting were pronounced very satisfactory.

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THE LANTERN SLIDE

PERHAPS no application of photography has had a wider and deeper influence upon education and entertainment than the perfecting of methods of making lantern slides. Those of us who remember the original paintings on glass can realize the convenience and accuracy of the modern procedures. Even the best work done in the earlier time was crude compared with that which any amateur produces now-a-days. The introduction of high-speed emulsions, and daylight loading films, with the improvements in the mechanical construction of the camera, have given an immense range to the production of interesting and useful pictures. Coincident with the improvements in photographic procedure have been the improvements in the projecting lantern, especially the illuminating installation. The old oil lamp of the "magic lantern," with its crude painted slips of glass, served, indeed, a good purpose for the amusement of children, but the modern high power lantern, with its accurate lenses, furnishes a different result. The field has been much widened by the invention of the color photograph, so that now even the artificial coloring of slides seems about to become obsolete. This result, however, has not yet been fully attained, for notwithstanding the brilliancy and beauty of the slides produced by the standard methods, a photograph, whether transparency or print, colored by a competent artist, has a quality which the automatic processes rarely, if ever, reach. This, indeed, is in accordance with the psychology of art, for photography has not in any way interfered with the standing of the artist, even though some modern photographers accomplish wonderful results with the camera. It may be a question whether the lantern slide is not now threatened in its popularity, for the development of high power lamps is rendering what is called "opaque projection" more and more effective, and many teachers are now using this method, especially valuable as it enables pictures to be shown in their natural colors.

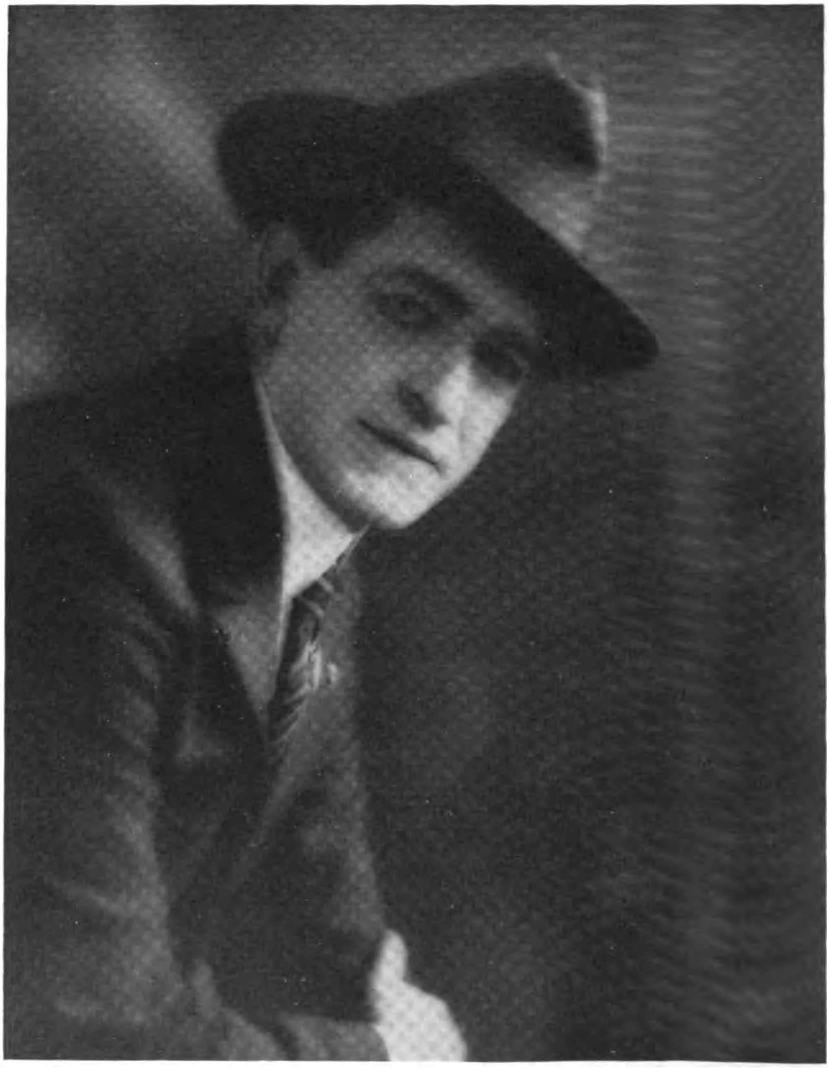
Many processes have been given for the production of good lantern slides. That a good negative is a great advantage does not need to be stated, but much may be done with a somewhat inferior one. Under ordinary circumstances, a negative will be prepared and positives made from it, but it sometimes happens that a lantern slide is wanted at short notice, for only a particular purpose, and in such case a reversal process will be convenient, enabling the positive to be made by a single exposure. One of the simplest of these methods is as follows:

The plate is given a good exposure and full development. The developer is then fully washed off, and the plate placed at the bottom of a black tray, with the coated side outward. A few inches of magnesium ribbon are then burned a short distance from the plate, taking care that no fragments of magnesia fall on it, and also very carefully protecting the eyes from the light. The plate is then immersed in a dilute solution of potassium bichromate, rendered strongly acid by sulphuric acid, until the silver image is entirely removed. This silver image has protected the bromide under it, while the undeveloped bromide has, of course, been light struck. The plate is removed from the acid solution, rinsed with water, immersed for a few minutes in five per cent solution of sodium sulphite, or better, bisulphite, rinsed again and returned to the developer. The second image is, of course, a positive and is fixed, washed and dried in the usual way. Good results can be obtained by this method, and a lantern slide can thus

DORIS KENYON NED VAN BUREN

KUBEY-REMBRANDT STUDIOS

Print on W. & C. "Satista" Paper



ROBERT CONVILLE NED VAN BUREN

be made much more rapidly than when the operator has to wait for the fixing, washing and drying of the negative, but, of course, the procedure is not suited for ordinary work in which the preservation of the negative is important.

Developing after fixing is also an interesting method of preparing lantern slides. As the finishing is done in full daylight, the density of the picture can be easily controlled. The preferable procedure is due to Lumière and Seyewetz. It depends on the use of a developer containing mercury. The solutions used are as follows:

A		B	
Water	1000 c.c.	Water	1000 c.c.
Sodium sulphite (dry)	180 grams	Sodium sulphite (dry)	20 grams
Mercuric bromide	9 grams	Metol	20 grams

For use, take 5 volumes of A to 1 volume of B.

The solution does not keep very well and should, therefore, not be made up in large amount.

The plate is given a full exposure and plunged at once into a dilute solution of hypo. Lumière and Seyewetz recommend 2% strength, but 5% may

"THE LADY AND THE DOG" KARL TAUSIG

be used and is more rapid. The plate must be left in the hypo until every trace of the silver salt is gone, and during this time must, of course, be kept in the dark. When the film is quite clear, the plate is well washed (this is very important) and then immersed in the developing solution. This part of the procedure can be conducted in full daylight. The image builds up slowly, but can be brought out completely, and a good lantern slide made.

At the present day, the positives are mostly made from the dry plates, but the wet collodion process gives generally the most brilliant results. Few photographers are, however, now provided with facilities for the wet process and hence it is but little used.

Two processes for automatic coloring of slides are now in active use—the autochrom and the Paget. The former is the simpler, but the slide is somewhat dense, and requires generally a pretty good light to show well on the screen. If the magnification is very great, the color effect will be destroyed by the appearance of the individual particles of the color layer, but this is as a rule only visible to the lecturer who is standing very near. The Paget process gives a more transparent image, but involves a good deal more manipulation than the autochrom. It uses a separable screen, employing a panchromatic emulsion for the negative and an ordinary emulsion for the positive. A viewing screen must be attached to the latter, and the exact adjustment of this and the maintaining of it in such adjustment is not a very easy task, but excellent results can be obtained with care. The autochrom, like the Paget negative plate, is panchromatic, but the development of these plates has been made much more easy by the use of phenosafranin as suggested by Lüppo-Cramer or the Desensol (Meteor) by John Marshall, and now widely known. Two minutes' immersion in a solution of this color (0.5 gram to 1000 c.c., 7.5 grains to the quart) will desensitize the plate without affecting the latent image so that it may be safely developed in red light. The slight red tint may be removed by thorough washing, and even if left, will not interfere with many of the uses of the plate.

The mounting of the slides is a simple process, needing no description here, but exposure in the lantern involves some care. The high power lamps required, in present day work, give out much heat, and may injure the picture as well as crack the glass. Autochrom and Paget slides are not adapted to stand much heat. The expedient commonly adopted is to insert a water cell between the condenser and the slide. This serves well in many cases, but ultimately the water becomes quite hot and not only loses its protective action, but air bubbles appear in it. Attempts have been made to increase the heat protection by dissolving certain compounds in the water, but the benefit of these is not, as a rule, appreciable. Recent issues of the *Photo-Revue* contain a long article on a new form of slide holder, which combines the water-cell with the movable portion of the holder. The fundamental principle is to have two small water cells, so that as a slide is withdrawn, the protecting cell is withdrawn also and thus the water in it given a chance to cool. It is strongly recommended to use recently boiled water, which has been kept in a tightly stoppered bottle, thus avoiding the formation of air bubbles when the water becomes warm. A simpler

DANA DESBORO NED VAN BUREN

"PORTRAIT" NED VAN BUREN

system would be to have constant flow of water in the cell, but this must be done with great care, or streams will appear on the screen in consequence of the mingling of water of different temperatures, which, therefore, have different refractive powers. Some years ago it was customary to use a solution of alum, based probably on the fact that alum cuts off a larger proportion of heat rays, than many other transparent substances, but this property belongs to solid alum, and is not appreciably developed in its solution. The French author just quoted suggests the addition of a small amount of copper acetate, 0.5%, that is, one part in 1000 of water, but it does not seem likely that this will produce a material absorption of heat. If used in much larger proportion, the water will be greenish-blue, which will, of course, be an objection.

A line of welcome improvement in lantern slides would be the substitution of film for glass. The weight and fragility of glass slides are serious drawbacks to the traveling exhibitor. The slow burning films will be entirely satisfactory, as they can be made quite transparent, will take colors as well as glass, and there seems to be no reason why they cannot be adapted to any of the standard processes of color photography. Under present conditions, however, films cannot be used satisfactorily except with a good water cell, as they are apt to curl under the heat. With the slow burning film, there is, of course, no danger of fire. Some years ago the material for celluloid slides were put on the market, including a cardboard frame, which made a very light and convenient article, but the method seems not to have come into general use.

It will be well if our inventors will turn their attention to constructing lantern accessories which will diminish the heat to which the slide is exposed, and also to securing films that will stand a moderate amount of heat without being damaged.

Before mounting, the slide should be well dried. A descriptive title and a mark to show how to place it in the slide-holder should be always attached, and in the case of photomicrographs, the magnification should be indicated.

PHOTOGRAPHING OUR TINY NEIGHBORS IN FIELD AND GARDEN—J. G. PRATT

WHETHER as profession or pastime, photographing the myriads of tiny forms in Nature is most fascinating, and unfolds a phase of life hitherto practically unknown. Moths and butterflies are beautiful, and the smaller specimens of beetles and soft-bodied insects are most interesting when magnified several diameters, and it is the purpose of this article to offer a few suggestions whereby any lover of the art, who has a fairly well equipped laboratory, can conduct some interesting experiments, and the subjects are right at hand and unlimited in number.

With patience and a high-powered telephoto lens, one can occasionally get a good snapshot of the larger moths and butterflies in flight, or when they have

alighted on a twig or flower, but these subjects are hard to find and the camera equipment is extremely expensive. The writer has photographed numerous insects while alive and at considerable magnification, but this is most difficult and hardly worth the effort of the amateur. The best way is to kill the specimen (in the case of beetles) by dropping them in boiling water for a few seconds, and placing the soft-bodied insects in a cyanid jar or in a bottle with a tuft of cotton saturated with a little chloroform or ether. The specimen can then be placed on a cork, and the legs and wings pinned out in natural position and left for a day or two until dry enough to stand alone. They are then ready to be photographed, and can be mounted on a flower or placed in some otherwise natural setting, if desired.

Of course, a special camera outfit is necessary, but this is not only inexpensive, but can probably be rigged up from odds and ends already on hand around the laboratory. The only requisite for taking direct photographs up to say six diameters, is a three- or four-inch anastigmat lens, and a long bellows camera. The old 5 x 7 view can be extended as far as desired by inserting a dark section between the plate back and the extended bellows; and the larger cameras, with big front boards, can be extended ten or twelve inches by inserting a long cone, one end to take the lens and the other to fit in the lens-board opening. It is best to rig up something in the way of a laboratory stand to hold the camera, and in most cases it is more convenient for this to be used vertically,

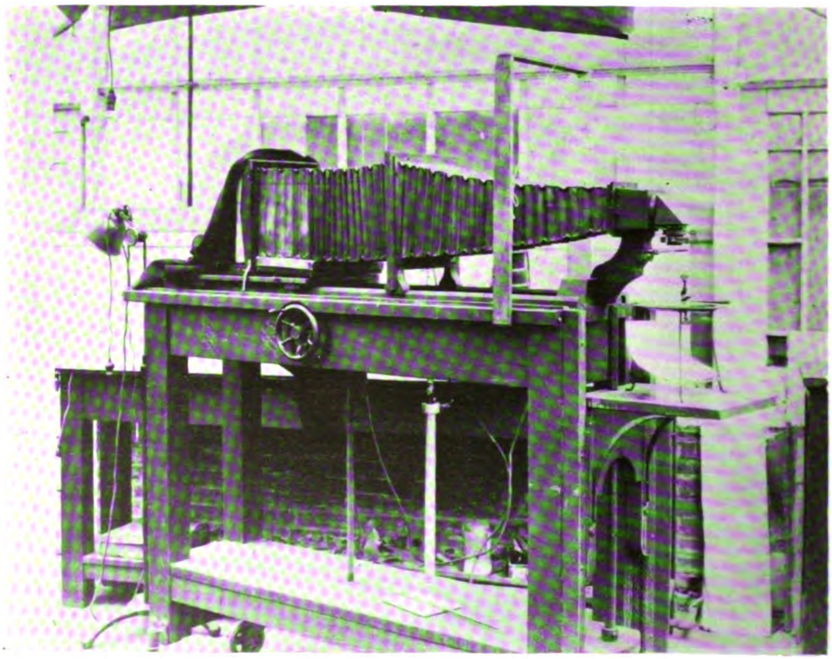


FIGURE 1. OUTFIT USED

as backgrounds can be controlled more easily and the specimens stay "put" on a horizontal surface.

Illustration No. 1 shows the outfit used by the writer, utilizing a prism so that the camera can remain horizontal for convenience, and still permit the lens to point downward. The rising and falling table for holding the specimens is controlled by a focusing wheel, and the bellows draw of five feet enables the taking of photographs up to twenty diameters.

The photographing of minute objects seems to work just backwards in many respects in comparison to the photography of ordinary subjects. For instance, the commercial photographer or pictorialist rarely takes objects even natural size; more often they are much reduced, and with such reduction he finds that his exposures decrease to mere fractions of a second, and his depth of focus increases to infinity, in such cases as buildings and landscapes in the distance. With magnification, the exposure increases to the square of the distance between the lens and the plate, and the depth of focus flattens out from about one quarter of an inch at four diameters, to about the thickness of a sheet of paper at twenty. As an example, a six-inch lens with a bellows draw of twelve inches, will photograph an object one diameter or natural size, we will say, in ten seconds. To magnify this object to ten diameters, it will be necessary to draw the bellows back about five feet, and the exposure will be the square of five, or 25, times the exposure for natural size, or 10 seconds, making 250 seconds or approximately four minutes. Of course this varies with the

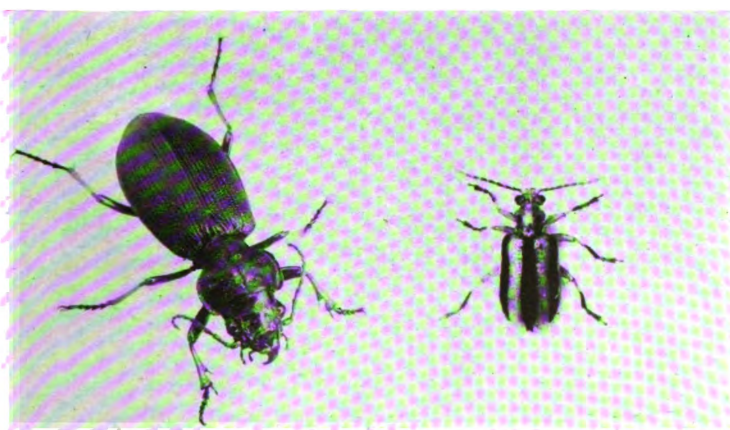


Fig. 2. This black beetle could only be magnified 3 diameters on account of the length of its legs. Taken with a panchromatic plate and no screen. It was tried on an orthonon film but with unsatisfactory results.

Fig. 3. The 3-lined potato beetle, magnified to 4 diameters. This insect which was taken alive, is deep orange and black in color, and was photographed with panchromatic plate and the orange (G) color screen. Ten seconds exposure with diaphragm open to 16.

Fig. 4. The sweet-potato tortoise beetle, deep yellow with black spines. They are less than ¼ inch in length and were magnified to 5 diameters, using panchromatic plate with K-2 filter.

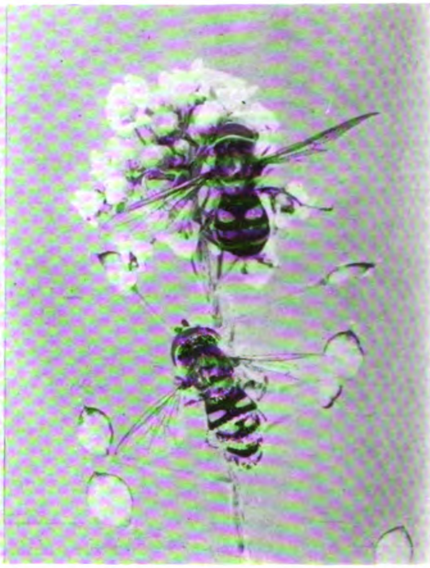


Fig. 5. A syrphid fly, taken about 5 diameters. This insect is black with orange-yellow markings, and was photographed on a panchromatic plate and a K-2 screen.

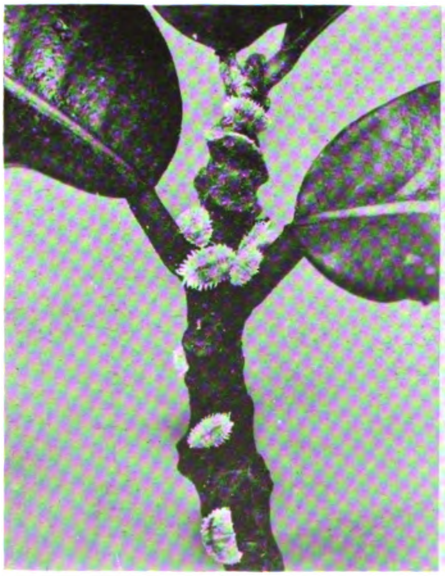


Fig. 6. Mealy-bugs taken alive at 5 diameters. Taken on clear glass with gray card underneath, using tissue paper hood to prevent reflections. Reduced carbonate developer to hold back the whites.

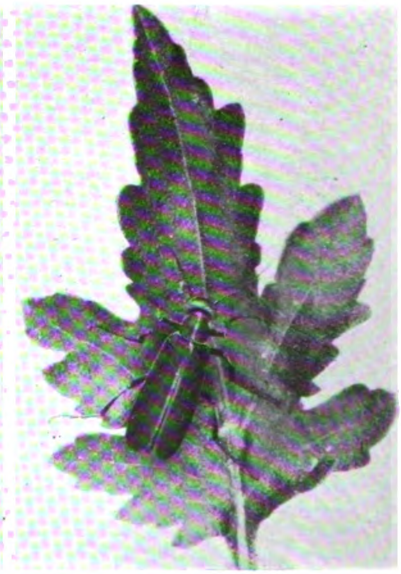


Fig. 7. A blister beetle, black with light stripes, on Chrysanthemum leaf. 5 diameters, orthonon film and no screen.

Fig. 8. Eggs of the tortoise beetle, magnified to 12 diameters using an orthonon film without filter. They are hardly distinguishable to the unaided eye, being about ½ of a millimeter in length.

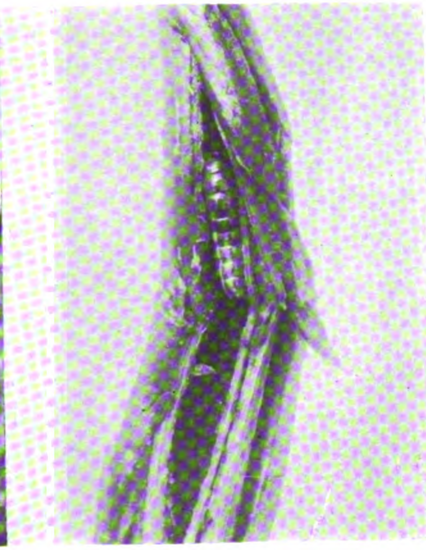


Fig. 9. The raspberry cane-borer, magnified to 18 diameters the insect being too small to be seen with the naked eye.

Fig 10. The pupa or young of one of the smallest grain beetles, being but a millimeter in length. It is a whitish, jelly-like creature, and although alive was readily photographed in this quiescent state in its earthen cell. 12 diameters, orthonon film and no screen.

Fig. 11. A termite or white ant, photographed 14 diameters to show the powerful mandibles with which it undermines the floors of buildings in certain sections of the country.

intensity of the sunlight and the density of the color screen employed. It is always advisable to stop down to a considerable extent in order to obtain as much depth of focus as is possible without at the same time prolonging the exposure too much.

It is advisable to use the longest focus lens which the bellows extension will permit for any given magnification. In my own case, I use a 7-inch lens for magnifications up to seven diameters; and a 72-mm or nearly three-inch lens, from eight to twenty diameters. The longer the focus, the further the lens is from the object; consequently, the better the perspective and greater the depth of focus. This is another phase of the subject working apparently opposite to the laws of ordinary photography where the short focus lens gives the greater depth of focus.

My camera is located in a greenhouse with strong light from every direction, and the exposures up to twelve diameters, using one of the Wratten and Wainwright color screens, and stopping down to 32, rarely exceed two or three minutes. It is evident, therefore, that where an object is to be magnified considerably, direct sunlight should be utilized, shielded perhaps by ground-glass or tissue paper.

A light yellow color screen, such as the W. and W. K-1, gives excellent results with orthonon plates or films, but where the denser screens are employed, it is necessary to use panchromatic plates or the exposures will be so lengthened as to be impractical. The general rule is to use panchromatic plates where the object contains red, orange or deep yellow; most other colors

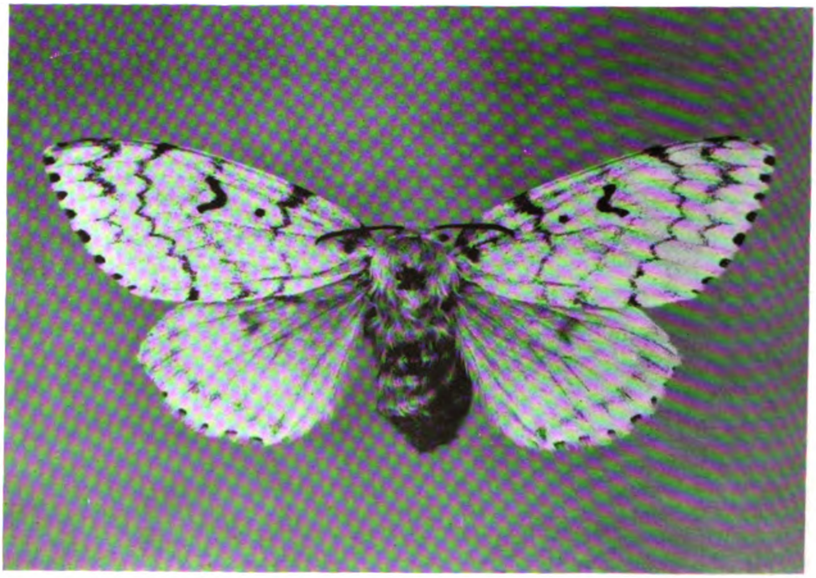


Fig. 12. The gipsy moth, illustrating the use of a gray background employing the "hatpin" method. Three diameters, taken on an orthonon film through a K-1 filter.

can be recorded satisfactorily on orthonon plates. The deeper screens, such as the K-3 or G, give the best color separations where the reds predominate.

The question of backgrounds enters very largely into this work. White grounds are the easiest and therefore the most used. They are had by placing the specimen on a piece of ground-glass with a white reflector several inches underneath, and preferably slanted to catch the light to best advantage. Black grounds are made by using what is known as the "dark box." This is merely a box covered on all six sides and lined inside with black paint or paper, and with a small aperture cut in the top. This specimen is placed on a clear glass over this black hole. If reflections across the plate are encountered, a tissue paper or tracing cloth hood, in the shape of a cornucopia, can be used completely covering the lens and the specimen. Of course this lengthens the exposure but the results amply justify the extra trouble. In cases where hoods are employed, the color screen can be placed on top of the lens inside the camera.

Gray or neutral backgrounds are somewhat difficult to secure, but are necessary with many specimens such as white hairy caterpillars or moths with light colored wings. The specimen is placed on a clear glass, being sure that it is free from dust, with gray cardboard several inches underneath, and the hood, above described, can be used if necessary to prevent reflections. Another

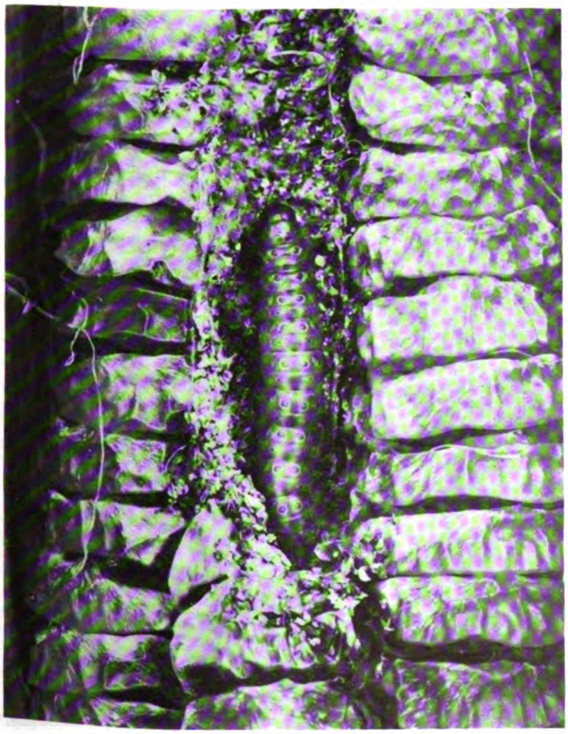


Fig. 13. The corn-borer, a gray snail-like worm Taken about 5 diameters using orthonon film and K-1 filter.

method, which is easier in some cases and more reliable, is to fasten a section of a hatpin vertically to a small flat board which has been covered with the gray card. The specimen can be placed on the end of this pin, and if the card is three or four inches below the specimen, it will be sufficiently out of focus to give a beautiful gray background. It should be mentioned that clean backgrounds cannot be obtained by placing the specimen on black or gray cardboard, as the tiny corrugations in the board when magnified give an ugly and mottled appearance, and generally also an undesirable shadow.

The writer began this phase of photography as a hobby, although it soon developed into a profession, and with Nature's gorgeous array of colors to be photographed, and the bringing into being, as it were, of these tiny denizens of the field and garden, the work seems more a pleasurable pastime than otherwise.

Fig. 14. The common potato beetle (orange and black) with its young or nymphs which are bright red, with black legs and protuberances on its sides. The beetle was a dried specimen, but the nymphs were alive. The lower specimen refused to remain still long enough for the exposure required through a G filter, and had to be photographed separately and printed in by vignetting the ends of the stalk together.

SPACE COMPOSITION—JOHN BARTLETT

PICTURE making, whether by brush and pigment or by lens and chemicals, is an art which aims at giving an impression of reality by means of two dimensions only—that is, the picture is essentially on a flat plane, having length and breadth, but no third dimension.

The picture maker must, therefore, do, consciously, in making his impression of reality, what we all do, unconsciously, when looking at it, *construct* the third dimension.

Now, it may be instructive to us who are in search of the pictorial presentation of Nature to try to determine the illusory methods which are made use of to accomplish the end and purpose of art.

The artist's first business, therefore, is to excite that peculiar faculty of the visual sense, which may be called tactile, or the power the eye has to touch, as it were, the things represented by his art.

To affect us pleasurably, and that is really artistically, we must have this illusion of varying muscular sensation stimulated to a lively degree.

The eye wanders from one plane of a picture to the other as if traveling over an extended field, journeying from foreground to distance and returning as from a delightful excursion.

The greater the picture is, the more in proportion will it excite our consciousness of tactile values, appealing to our imagination as much or, perhaps, more than the object itself.

Fig. 15. A white worm magnified 7 diameters, showing its relative size in comparison with a grain of wheat which it injures.

Fig. 16. The buffalo tree-hopper; 7 diameters, illustrating the use of the dark-box background method.

Without this power of stimulating tactile visual perception, representations of things become mere symbols, unintelligible hieroglyphics, giving us some impression, but losing the grand function of art, illusionary appeal to the highest of all our faculties—the imagination.

What do we mean when we talk of artistic pleasure? Artistic pleasure, or rather the enjoyment of pictures, is quite different from the pleasure we experience when reading a beautiful poem, and, consciously or unconsciously, we never judge a picture for its dramatic presentation of a subject—that is the province of literature. Nor is artistic pleasure anything akin to the pleasure we delight in in hearing sweet music.

Indeed, pictorial art is said to be in a sort of degeneracy when it affects to take the place of the other muses.

We should keep this truth in mind, that because painting cannot rival Nature, art is not defective. On the other hand, it is only defective when it fails to do what is its true function.

The axiom, that the most perfect art is that in which art is most concealed, does not imply that concealment of art means concealment of imitation or that deception which it gives is to be passed on us for a reality, for then we should immediately want what we never miss in a fine picture, motion and sound

We should understand that the illusion of art is quite another thing from mere deception of the eye, and that such deception would, in fact, destroy illusion. "Imitation," as Coleridge says, "is the mesothesis of likeness and difference." The difference is as essential to it as the likeness, for without difference it would be a copy or facsimile.

The imitation of Nature in a picture delights us not merely because it is an imitation of the actual, but because our imagination is excited, our understanding appealed to, and we have a secret gratification in the consciousness of the feeling aroused within us. In a word, an appeal is made to us which flatters us in revealing to us that we have the ability to appreciate what is grand or beautiful.

We never lay such flattering unction to our souls when we view a group of wax figures—the most lifelike in externals of all the modes of imitating Nature, and for that very reason the most lifeless.

At any exhibition of paintings one is convinced of the fact that there is a widespread interest in pictures.

The people who throng public galleries are of every walk in life, yet each seems to enjoy the contemplation.

The pictures do not appeal alone to the cultivated few, but the delight is universal and genuine. True, some gaze with rapture on a canvas depicting an old pine board with a dollar bill pinned on it, a few lucifer matches, a jug of beer and a cigar stump.

Others descant in glowing terms on the realistic perfection of a brace of game hung up on a nail with a string, so accurately delineated that one feels tempted to cut the string to see the birds fall. Others, with more cultivated taste, will admire a bowl of flowers or a plate of apples. But with the great

majority there is demanded, for their enjoyment of the picture, something more than mere deception; the subject itself must be interesting.

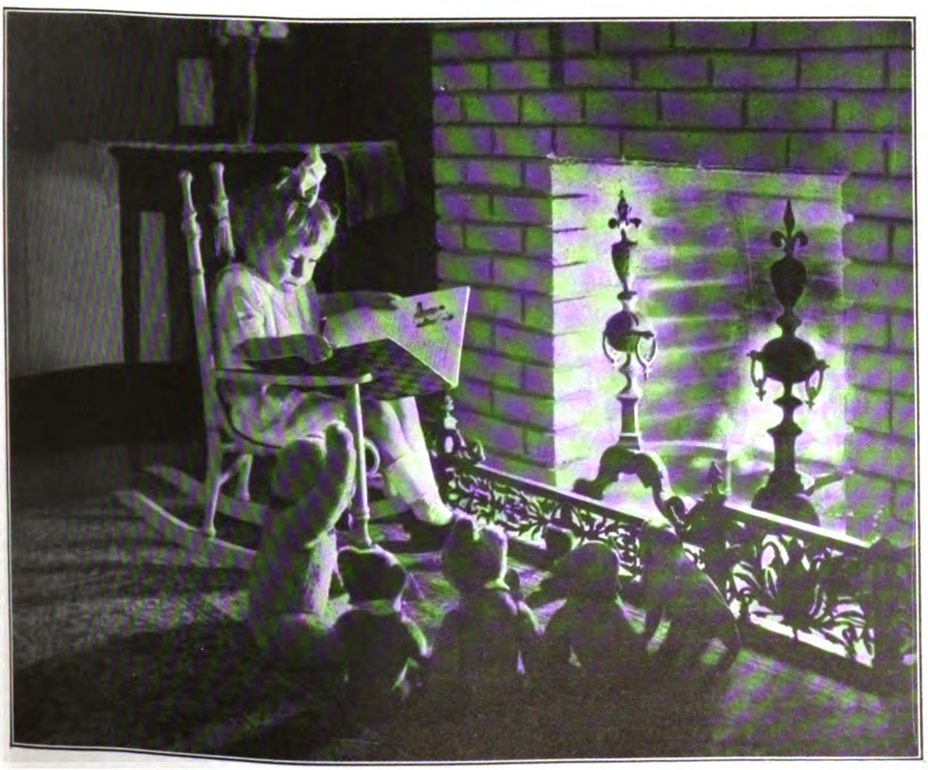
They love a sunny landscape, with cows in a shady pool, or a brilliant portrait of an actress or a favorite soubrette, or they must have some sentiment on the canvas, or the picture must tell a pleasing story.

With all such the picture must appeal to the sense of reality. They love to see what they are familiar with, and so all of us do in a measure.

But after awhile, as our experience widens by association with a few pictures which we at first passed by as either altogether incomprehensible or else contrary to what we considered true to Nature, we find a growing sense that we are beginning to weary of those clever pieces of manual dexterity, those deceptions of the painter, even though the fruit is so perfectly painted that the birds fly down to peck it.

We are conscious, then, of a demand for something besides mere accurate presentation; then we begin to wonder what is there in those queer pictures we used to pass by as utterly incomprehensible, but which the painter values so highly. Now, this is the dividing of the roads with us, and the same fork which confronts photography just now.

The old manner and fashion of looking at and judging of photographs is giving place to a broader conception—and we are beginning to perceive that



Reproduction of picture which won the prize offered by John G. Marshall in the February Meteor Flash Powder Competition. Made by Archie Towart, Jr., Caldwell, N.J.

photography as an art is approaching, if it has not already reached, that position when it ceases to be mere reproduction, and has become artistic production.

This, by way of preface, is to make plain the distinction between illusion and deception, though we may have been a little prolix.

We have sought to emphasize that the essential in a picture is the illusion presented by the rendering of the tactile values or representation by space composition, because the visual sense thus realizes forms better than we do even in the actual; and the master in tactile values gives us a revelation, opens our eyes to the appreciation of what in Nature was not so obvious to us until brought out by his art.

He communicates what he is striving for in his picture—the material but artistic signification of form.

If the object in Nature is in itself beautiful, why, when transformed by art, is it enhanced in its power to give pleasure, by some method of transfiguration? This question criticism does not answer, and we are still left vaguely wandering and dissatisfied in a maze, trying to guide ourselves with artistic rules and codes in our efforts to get to the temple of art.

It is well to bear in mind that in venturing our opinions as to the merits or defects of any work to a clear and instructed eye, our opinion shows plainly enough our range of apprehension and insight, but nothing at all of the relative value of the work with reference to other works.

Our critical efforts should be directed to endeavors to determine why a picture pleases rather than to an exposition of its defects.

The exact visual impression of objects is what realism gives us. We have well-illuminated figures, well posed, perfect in perspective (the lens does this for us, guided, of course, by taste and judgment), and full appreciation of tonal values. These qualities are excellent, and dare not be ignored or slighted in painting or photography, but they are not the characteristics which make a picture convey to our imagination the corporeal significance of objects.

The painter or photographer must select from the many possible variations of light and shade or differences of posture just those elements which shall convey this illusion of spacial composition, and it may be from the very desire to express space composition that he frequently offends our conceptions of the beauty and value of gradation of light and shade, and we may accuse him of affectation in impressionism. We fear we have not very clearly expressed what is meant by space composition or tactile visual perception. It is, after all, a conception rather than perception which dawns upon us while studying grand pictures. It is an awakening to the consciousness that space is something the mind supplies, and that it is not an empty void, but a reality, in which the objects of the picture move and live and have their being.

The appreciation of it comes into our consciousness only when we get the true idea of what it is. It is not a negative, in which an object is isolated—not a mere background, but something very tangible to the imagination, heightening our idea of the reality of things. Instead of confining the figure to definite limits or boundaries, it opens out the area it seems to enclose.

Materia Photographica

A Dictionary of the Chemicals and Raw Materials of Photography

Part I—General Materials

Part II—Dyes and Developing Agents

BY

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PHILADELPHIA

THE PHOTOGRAPHIC JOURNAL OF AMERICA

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1922

INTERNATIONAL ATOMIC WEIGHTS
1921

	Symbol	Atomic Weight
Aluminum	Al	27.1
Antimony	Sb	120.2
Argon	A	39.9
Arsenic	As	74.96
Barium	Ba	137.37
Bismuth	Bi	208.0
Boron	B	10.9
Bromine	Br	79.92
Cadmium	Cd	112.40
Calcium	Ca	40.07
Carbon	C	12.005
Cerium	Ce	140.25
Cesium	Cs	132.81
Chlorine	Cl	35.46
Chromium	Cr	52.0
Cobalt	Co	58.97
Columbium	Cb	93.1
Copper	Cu	63.57
Dysprosium	Dy	162.5
Erbium	Er	167.7
Europium	Eu	152.0
Fluorine	F	19.0
Gadolium	Gd	157.3
Gallium	Ga	70.1
Germanium	Ge	72.5
Glucinum	Gl	9.1
Gold	Au	197.2
Helium	He	4.00
Holmium	Ho	163.5
Hydrogen	H	1.008
Indium	In	114.8
Iodine	I	126.92
Iridium	Ir	193.1
Iron	Fe	55.84
Krypton	Kr	82.92
Lanthanum	La	139.0
Lead	Pb	207.20
Lithium	Li	6.94
Lutecium	Lu	175.0
Magnesium	Mg	24.32
Manganese	Mn	53.93
Mercury	Hg	200.6
Molybdenum	Mo	96.0
Neodymium	Nd	144.3
Neon	Ne	20.2
Nickel	Ni	58.68
Niton (radium emanation)	Nt	222.4
Nitrogen	N	14.008
Osmium	Os	190.9
Oxygen	O	16.00
Palladium	Pd	106.7
Phosphorus	P	31.04
Platinum	Pt	195.2
Potassium	K	39.10
Praseodymium	Pr	140.9
Radium	Ra	226.0
Rhodium	Rh	102.9
Rubidium	Rb	85.45
Ruthenium	Ru	101.7
Samarium	Sa	150.4
Scandium	Sc	45.1
Selenium	Se	79.2
Silicon	Si	28.3
Silver	Ag	107.88
Sodium	Na	23.00
Strontium	Sr	87.63
Sulphur	S	32.06
Tantalum	Ta	181.5
Tellurium	Te	127.5
Terbium	Tb	159.2
Thallium	Tl	204.0
Thorium	Th	232.15
Thulium	Tm	168.5
Tin	Sn	118.7
Titanium	Ti	48.1
Tungsten	W	184.0
Uranium	U	238.2
Vanadium	V	51.0
Xenon	Xe	130.2
Ytterbium (Neoytterbium)	Yb	173.5
Yttrium	Yt	89.33
Zinc	Zn	65.37
Zirconium	Zr	90.6

ABBREVIATIONS USED IN DESCRIBING MATERIALS

A.P.—Average price
A.W.—Atomic weight
B.P.—Boiling point
Der.—Derivation
Fr.—French
Ger.—German
G.—Grade suitable for photographic use
Ins.—Insoluble
M.P.—Melting point
M.W.—Molecular weight
P.—Properties
Sap.—Soluble in all proportions
Sol.—Soluble
Sp. G.—Specific Gravity
Ss.—Slightly soluble
Syn.—Synonym
U.P.—Uses in photography

MATERIA PHOTOGRAPHICA

Part I—General Chemicals and Raw Materials

ACETONE, $(CH_3)_2CO$

Fr. Acétone; Ger. Aceton

Syn. Dimethyl-ketone, Ketopropane, Methylacetal, Propanone, Pyroacetic ether.
M.W. 58; Sp. G. about 0.798; M.P. -94.3°C; B.P. 56.48°C.
Sol. in water, alcohol and ether

P. Colorless liquid, mint-like odor, highly volatile and inflammable. Should be kept in well stoppered bottles in a cool place.

Der. By dry distillation of calcium acetate also as a by-product in the manufacture of butyl alcohol. Purified by rectification.

G. Technical; U.S.P. (98% Acetone). Should not show more than a trace of acidity.

A. P. 45 cents per lb.

U. P. Solvent for resins, collodion, nitrocellulose; used in manufacture of sheet celluloid, varnishes and film cements, can be used as a substitute for the alkali in pyro or hydroquinone developers.
The acid amidol developer can be remarkably energized by the addition of from 3 to 5% acetone.

ACETONE SULPHITE, $NaHSO_3\ (CH_3)_2CO\ H_2O$

Fr. Acétone sulfite; Ger. Acetonsulphit.

M. W. 162.

Sol. in water; Ss. in alcohol.

P. Fine white Powder.

Der. Acetone combined with acid sodium sulphite.

U. P. Substitute for sodium sulphite and the metabisulphites in development. 10 parts acetone sulphite are equal to 7.5 parts of potassium metabisulphite or 20 parts of dry sodium sulphite. As a preservative of pyro, ½ ounce of acetone sulphite is added for each ounce of pyro used. Keeps fixing baths clear and colorless.

ACID ACETIC, $HC_2H_3O_2$

Fr. Acide Acétique; Ger. Essigsäure

Syn. Acid methanecarboxylic, Vinegar acid, Purified Pyroligneous acid.

M. W. 60: M.P. 16.7°C: B.P. 118.1°C.

Sol. in water, alcohol, ether, chloroform and glycerine.

P. Colorless liquid, sour pungent smell, vapor inflammable, congeals at 15.65°C.

Der. Prepared from wood by destructive distillation, also by the oxidation of dilute ethyl alcohol, governed by bacterial action.

G. Two grades commonly used in photography, Glacial Acetic Acid, U.S.P. (99% acetic acid) Sp. G. about 1.065, congeals at about 12.8°C. hence the name glacial (or ice like) acetic acid. Commercial grade (28% acetic acid) Sp. G. 1.038; This strength acid can be easily prepared from the glacial acid by dilution with distilled water. Glacial acetic acid is a strong escharotic, if spilt on the skin should be washed off at once. The impurities often found in acetic acids are sulphurous acid, tarry matters, hydrochloric or sulphuric acid. Samples which yield a precipitate when a drop of silver nitrate solution is added to a quarter of an ounce, or which discolor when the mixture is exposed to light, should be rejected.

A. P. Glacial, U.S.P. 35 cents per lb. 28% acid, 17 cents per lb.

U. P. Preparation of acid fixing baths. As a clearing bath after ferrous oxalate development of bromide paper. Used in the uranium toning bath facilitates the penetration of the gelatine by the bath. Solvent for gelatine, celluloid, pyroxyline. Used in the manufacture of cellulose acetate. Preparation of gelatine substratum.

ACID BENZOIC, C_6H_5COOH

Fr. Acide benzoique.; Ger. Benzoesäure

Syn. Acid phenylformic.

M. W. 122: Sp. G. 1.2659: M. P. 121.25°C B. P. 249.2°C.

Sol. in alcohol and ether, Ss. in water. Freely soluble in chloroform or benzene.

P. White voluminous crystalline plates or needles. Aromatic odor.

Der. From gum benzoin by sublimation. Industrially, by the chlorination of toluol to benzenyl trichloride, heating this under pressure with milk of lime. The benzoic acid is distilled off by steam and crystallized.

G. U.S P. from benzoin

A. P. 65 cents per oz.

U. P. Has been used as a preservative in photographic emulsions, used in toning baths and for the sizing and surfacing of photographic paper.

ACID BORIC, H_3BO_3

Fr. Acide borique.; Ger. Borsäure

Syn. Acid boracic, Acid orthoboric.

M. W. 62: Sp. G. 1.4347: M. P. 184°C.

Sol. in water, alcohol, glycerine, and volatile oils.

P. White shining scales or amorphous powder.

Der. By the addition of hydrochloric or sulphuric acid to a solution of borax and crystallizing.

G. U.S.P. crystal or powder.

A. P. 35 cents per lb.

U. P. Used in pyro developers as a restrainer and to prevent stains, can also be used in the fixing bath as a stain preventer. A solution of 1 part boric acid in 30 parts of water acts as a stop bath, stopping development instantly.

ACID CARBOLIC (Phenol), C_6H_5OH

Fr. Acide Phénique; Ger. Karbolsäure

Syn. Phenic acid, Phenyl hydrate, Hydroxybenzene.

M. W. 94: Sp. G. 1.0677: M. P. 42.5°C.: B. P. 182.6°C.

Sol. in water, alcohol, ether, chloroform, glycerine and alkalis.

P. White crystalline mass, turns pink or red if not pure, absorbs water from the air and liquifies, has sharp burning taste and distinctive odor, strong corrosive poison.

Der. By treating coal tar oil fraction, boiling between 170° and 230°C. with caustic soda to form phenolate. The solution is purified by removing the naphthalene, treated with acid to set the phenol free which is further purified by distillation. It can also be prepared by converting benzol into sulfonic acid and fusing the latter with caustic soda. On treating the sulfonate with acid pure phenol is released.

G. U.S.P. crystals or fused.

A. P. 34 cents per pound.

U. P. Used as a preservative for photographic emulsions, gelatine solutions, and mountants. It is the starting point of many of the photographic chemicals, developers and dyes.

ACID CHROMIC (Anhydride), CrO_3

Fr. Acide Chromique; Ger. Chromsäure Anhydrid

Syn. Chromium trioxide.

M. W. 100: Sp. G. 2.67: M. P. 196°C.

Sol. in water.

P. Redish brown crystals. Violently explodes when brought into contact with organic substances. Highly poisonous.

Der. Hydrochloric or sulphuric acid added to a solution of sodium bichromate and the product recovered by recrystallization.

G. C. P.

A. P. $3.00 per pound.

U. P. Principal use in process work in the fish glue process. Used in conjunction with sulphuric acid for clearing the fish glue image previous to etching, removing any scum from between the half-tone dots.

ACID CITRIC, $(CO_2HCH_2)_2C(OH)CO_2H$

Fr. Acide Citrique; Ger. Citronensäure

Syn. Acid oxytricarballylic.

M. W. 210: Sp. G. 1.542: M.P. 153°C.

Sol. in water, alcohol and ether.

P. Colorless, odorless crystals, with characteristic lemon flavor.

Der. Crude citric acid is obtained from lemons or other citrus fruit, then neutralized with calcium carbonate and the lime salt dissociated with sulphuric acid. The product is then filtered, evaporated and recovered by crystallization. Tartaric acid is the most likely impurity to be expected.

G. U.S.P. crystal or powder.

A. P. 75 cents per pound.

U. P.—Citric acid can be used as a preservative in some developing solutions and in others acts as a restrainer. Can be used for making acid fixing baths and as a preservative in emulsions. 1 part citric acid to 100 of water is an excellent clearing bath for removing the yellow pyro stain from negatives. Used in the preparation of gelatino citro chloride printing-out paper.

Citric acid can be used to replace acetic acid in photographic solutions. 1 oz. of citric acid is equivalent to 2 ozs. of 28% acetic acid. Citric acid will replace glacial acetic acid weight for weight.

ACID DIGALLIC (Tannin), $C_{10}H_{14}O_9$

Fr. Acide Tannique; Ger. Gerbsäure

Syn. Acid gallotannic.

M. W. 322: M. P. Decomposes at 210°C.

Sol. in water and alcohol.

Ss. in ether.

P. lustrous, faintly yellow amorphous powder.

Der. Extracted from powdered gall nuts with water and alcohol, then evaporated and purified by crystallization.

G. U. S. P.

A. P. $1.00 per pound.

U. P. Principal use in process work as an ingredient in the etching solution for collotype plates acting as a hardener of the gelatine. Has been recommended as a hardening agent for prints and negatives, but is likely to give some stain.

ACID FORMIC, HCOOH

Fr. Acide Formique; Ger. Ameisensäure

Syn. Acid hydrogen carboxylic.

M. W. 46: Sp. G. 1.2178: M. P. 8.3° C.; B. P. 100.8°C.

Sol. in water, alcohol and ether.

P. Colorless liquid, pungent odor, very strong caustic.

Der. By dissociation of sodium formate with mineral acid, then by distillation and absorption in distilled water. Purified by rectification.

G. U. S. P. 75%

A. P. 75 cents per pound.

U. P. Comparatively unimportant in photography. Is sometimes used in process work instead of acetic acid for stripping of wet collodion negatives. Its disadvantage is, however, its dangerous caustic properties.

(To be continued)

The PHOTOGRAPHIC · JOURNAL · · of AMERICA ·

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Toronto Salon, 1922

The Thirty-first Annual Toronto Salon of Photography will be held at the Canadian National Exhibition from August Twenty-sixth to September Ninth, 1922, under the direction of The Toronto Camera Club.

Owing to the continued success of this annual event, the authorities of the Canadian National Exhibition have this year placed at our disposal the largest and most commodious gallery in the Building of Applied Arts, in which we hope to hang upwards of six hundred prints.

The Committee again appeals for the support of the pictorial photographers of the United States which has so generously been forthcoming in past years, and as the quality of the prints submitted has left nothing to be desired, we again this year ask for an even larger list of entries.

Send for Entry Form.

CONDITIONS

1. All prints submitted must be entirely the work of the exhibitor mounted but not framed, preferably on white or light toned mounts 16, 20, or 24 inches in height.
2. Each print must show on the back, number, title, name of artist and return address to agree with entry form.
3. Not more than eight prints may be entered by one exhibitor and only prints showing distinct artistic effort accepted.
4. Prints must be packed flat, adequately protected, charges prepaid to reach destination not later than July 29, 1922.
5. All entries from outside of Canada must be sent by Post only and to facilitate shipping and Customs entry, kindly use the shipping label attached to Entry Form.
6. Special care will be taken of all prints, but the Club cannot assume responsibility for unavoidable loss or damage.
7. Each person submitting prints will be furnished with the catalogue of the Salon, which will be official notification of the acceptance or rejection of prints.
8. Prints will be carefully repacked and returned immediately after the close of the Salon, charges prepaid and a certificate will be attached to the back of each print accepted and hung.
9. All prints submitted will be given full consideration by a competent Jury of Selection conversant and in sympathy with photography as an art and their decision shall be accepted as final.
10. An entry fee of fifty cents must accompany each entry form.

Address all communications and packages to J. H. Mackay, Sec'y Salon Committee, The Toronto Camera Club, 2 Gould Street, Toronto, Canada.

Technical Photographers and Microscopists to Form Society

There are none of the technical, scientific or industrial arts that are not largely indebted to photography; nevertheless, up to the present time there has been but little effort made by the technical and industrial photographers, or those engaged in research and scientific work to present to the public interested in applied photography, the scope and possibility of photography, which practically seems to have no limitation.

At the Waldorf Astoria Hotel, New York, a preliminary meeting of the Industrial and Technical Photographers was held April 10th, and plans were laid and matters discussed about a special exhibition of one of the many provinces of photography, that of micro-photography as a means of industrial research, the chairman of which is Mr. John H. Graff.

In response to our desire for publication of any matter relative to this most important movement Mr. Graff kindly sends us his introductory remarks, read at the preliminary meeting at the Waldorf Astoria.

We have read these remarks of Mr. Graff with intense interest and feel that photographers will everywhere appreciate

the value of this great movement, which is so exhaustively set forth in the communication. We publish the report in its entirety.

"As a result of an article published last fall in different industrial and technical magazines, many requests have been made for an exhibition of industrial and technical photography, but as industrial and technical photography are applied to all branches of commerce, industry, and science, this, as you will admit, could not be decided by an individual or an individual concern, but should be decided upon and carried out by men representing commercial, industrial, technical, and scientific associations, which you gentlemen represent.

"Allow me, however, to repeat the first part of this before mentioned article.

"'During the past few years photography has more and more developed to be an important factor in industry, commerce, and science, and a number of large concerns have established permanent photographic departments of their own, as an aid to better efficiency in administration, engineering, research, buying, selling, advertising, education, co-operation, and for many special purposes peculiar to the individual needs of the concerns.

"'All have been striving for the same results—to make photography a help and not merely an added over-head expense. As industrial and technical photography not only has come to stay, but will get a much larger application in the future than heretofore, it would seem wise if all organizations which use photography in one form or another, could put their experiences together for the mutual benefit of all.'

"We must, however, not confuse industrial and technical photography with commercial photography, although these two different branches often overlap, and the commercial photographer, in many instances, has done much for the full appreciation of the value of photography in industry and science. The problems of industrial photography are too many-sided, and interwoven so much with the knowledge of other science, namely, administration, engineering, chemistry, physics, optics and mathematics, making it absolutely impossible to be covered by the average commercial photographer.

"Industrial and technical photography can roughly be divided into three classes.

"*First:* Work done with ordinary cameras, as a tool of management, making photographic records of control and record boards, photographs of accidents and damages, photographs demonstrating evidence of waste and salvage, demonstration of safety ideas and accident prevention, and for copying drawings and documents, thereby saving time and labor, and in standardizing records. The ordinary camera is also used in numerous ways as a field instrument, and as a valuable aid to the engineer making progress reports of construction, and illustrations for field investigation, trade reports, and industrial reports.

"*Second:* Photomicrographic and macrographic work. This work which formerly was only done by the scientist in pure research, is now more and more used to solve daily commercial and industrial problems. Metallography has long been a great factor in metallurgical development and research, but photomicrography and macrography today also have a practical application in the cement industry and the scientific study of concrete, in the study of powder, dynamite and other explosives, for the comparison of raw material used in the manufacture of drugs and chemicals. They are also used in studying gelatine and other emulsions, and industrial investigation of yeast cultures, bacteria and moulds. Of great importance is also the use of photomicrographs in determining the particle sizes in paint and rubber pigment, etc., and it is used in studying the different tanning treatments in leather, and also in the vulcanized rubber industry. But second only to metallography are the uses of photomimicro and macrographs in the textile industry and pulp and paper industry. The study of the raw material or the finished product is, however, only a small part of the work. The biggest value is in ability to record and compare the result of the different chemical and physical processes of production.

"*Third:* Photographic work needing specially constructed equipment. The two former classes of photography can usually be done with instruments of more or less standard form sold by manufacturers of photographic equipment, but many industrial and technical problems in photography require specially designed apparatus and equipment of which it is only necessary to mention a few, illustrating the immense scope of this work, as, for example, special equipment making it possible to take photographs of physical phenomena, and illus-

trating the workings of physical laws, photo-micrographic moving picture machines, and special moving picture cameras, making it possible to study the detail of motions or the breaks or stress of physical tests. In this class also come the different types of photographic recording instruments, but the most important in this class are the different types of instruments used for photogrametric or photopographical work. All of these are as yet more or less in an experimental stage, but in the near future these will be developed not only to a very important but very practical use.

"The Eastman Kodak Company is developing a very practical aerial camera for aerial photographic mapping. Carl Zeiss has put a Stereophoto Thedolite on the market which has a remarkable accuracy, and with the Photocomparator made by the same concern, maps can be plotted automatically from photographs.

"Major James W. Bagley, of the United States Geological Survey, has developed a panoramic camera for surveying by the triangulation method, and with a specially constructed Photo Alidade, the maps can be plotted with great accuracy.

"Personally, I have had opportunity to make a modification of Major Bagley's method, so that it is possible for the forest cruiser not only to take accurate photographs for mapping purposes, but with the same instrument to take detail photographs of the condition of the forest type.

"Industrial and technical photography are undoubtedly also used for many other purposes, but the foregoing fully illustrates their uses in photobibliographic research, report and record keeping. Although a concern may only use these methods for one or two of the before mentioned instances, an exhibition of a collection of all these different uses can do nothing but broaden the field and be an aid to the individual. An exhibition of this kind not only will be of assistance to those who have already established their own photographic departments, but it will demonstrate the value of the work to others who would be benefited by applying these forms of photography.

"Besides the valuable knowledge gained by a conference and exhibition of this kind in regard to application, technique, equipment, and material, it would demonstrate if it would be beneficial to form a permanent association for the development of industrial and technical photography and the necessary qualifications for the men selected to do this work. The proposed convention would not only be of value to those of us who have already entered this field, or those who by an exhibition of this kind would be made familiar with the practicability of adopting it for their own use, but also to the manufacturers of photographic equipment and material, and optical and other scientific instruments related to the same.

"This, of course, is only a ramification of what is understood by the term industrial and technical photography. You gentlemen, representing different trade and technical associations and scientific societies, are familiar with its special use inside your own particular groups and the interest toward same by the members of these groups. We know that we all have many problems in common and that we can learn much from each other, and it is for you to decide if you think it would be practical, sometime in the near future, to have an exhibition and convention of industrial and technical photography, and if you believe same would meet with success.

"The questions to come before this meeting are:—

"1. Shall we have a convention and exhibition in the near future?

"2. Where and at what time should this be held?

"3. What will it take to finance same, and how shall this money be obtained?

"If these questions can be answered to our satisfaction, you gentlemen must elect the general committee for The First International Convention of Applied Industrial and Technical Photography.

"It is needless for me to state how this should be composed, as all of you have had more or less experience in organizing conventions, but I would suggest that you have a president, secretary-treasurer and the following sub-committees:—

A. Finance Committee.
B. Committee on Publicity.
C. Exhibition Committee.
D. Speaker's Committee.
E. Committee on Arrangement and Entertainment.
F. Transportation and Hotel Committee,

and any other committees which your experience should deem it necessary to have in order to carry out a convention of this kind successfully.

"In concluding, allow me to mention a few men whose co-operation should be sought and who either can arrange for

individual exhibition or would be valuable speakers at the convention:

Dr. Kenneth Mees, Eastman Kodak Co. Any subject.

Dr. Alfred B. Hitchins, Ansco Co. Any subject.

Dr. S. W. Stratton, U. S. Bureau of Standards. Subject: Industrial and Technical Photography as applied by the U. S. Government.

Dr. Emile Monnin Chamoth, Cornell University. Subject: Photomicrography in Chemical Microscopy.

Dr. L. A. Hausman, Cornell University. Subject: Photomicrographic Classification of Textile Fibres and Furs.

Dr. E. J. Wall, 38 Bromfield St., Wollaston, Mass. Subject: The Education and Training of the Industrial and Technical Photographer.

Major James W. Bagley, United States Geological Survey. Subject: Different Methods of Photogrametry.

Mr. F. A. McLean, Canadian Ingersoll-Rand Co., Sherbrook, Quebec. Subject: The Value of Shop Photography and How to Prepare It.

Mr. Frank A. Gooding, Editorial Staff, Factory, Chicago. Subject: Using the Camera as a Tool of Management.

Mr. John Arthur Wilson, Chief Chemist, A. F. Gollun & Sons Co., Milwaukee, Wis. Subject: Photomicrography in Leather Research.

Mr. Arthur Warishechek, General Electric Co., Washington, D. C. Subject: The Compilation of Technical Data With the Aid of Photography.

Mr. Ellis Frompton, Hammermill Paper Co., Erie, Pa. Subject: Spreading Safety Ideas by Photography.

Mr. J. W. Leyg, Research Engineering Dept., Westinghouse Electric Mfg. Co. Subject: The Multi-Exposure, High-Speed Camera.

Mr. Nathan C. Johnsen, New York City. Subject: Photomicrographic Study of Concrete.

Mr. Henry Green, Research Laboratory, New Jersey Zinc Co., Palmerton, Pa. Subject: Photomicrographic Methods for the Determination of Particle Size.

Messrs. A. Depew and J. R. Ruby, Research Laboratory, New Jersey Zinc Co., Subject: Photomicrographs of Micro sections from Vulcanized Rubber Articles.

Mr. F. J. Hoxie, Warwick Mills, Centerville, R. I. Subject: Industrial Photography in the Textile Industry.

Mr. Ralph D. Moore, published an article in *Concrete*, 'The Camera as a Field Instrument.'

Mr. Arthur Eldridge, published an article in *Chemical & Metallurgical Engineering*, May, 1919, 'Photography in Research.'

Mr. H. J. French, Metallurgical Engineer, published an article in *Chemical & Metallurgical Engineering*, Jan. 19, 1921. 'Motion Pictures in Physical Testing Laboratory.' "

Society Formed

Since the receipt of the above notice of the preliminary meeting of Technical Photographers and Microscopists Society, we have been favored with the following announcement of its inauguration:

The Technical Photographic and Microscopical Society was fully organized at a meeting held in the Chemists' Club, New York, on May 10th. The nucleus of the organization was formed at the annual meeting of the American Paper and Pulp Association in April.

"Charles F. Roth, who acted as chairman of the meeting on Wednesday, gave an acount of the organization work to date and outlined its possibilities. It is planned to hold a general convention of industrial and microscopical photographers in connection with an exhibition of photographic work, chemicals and apparatus to be held during the week of the National Exposition of Chemical Industries, September 11 to 16.

"Officers were elected as follows:—President, James McDowell, of Sharp & Hamilton Manufacturing Co., Boston; vice-presidents, John H. Graff, of the Brown Co., Berlin, N. H. and Bennett Grotta, of the Atlas Powder Co., Tamaqua, Pa.: secretary-treasurer, Thomas J. Keenan, editor of *Paper*, 251 West Nineteenth street New York. An active Committee on Membership and Publicity was appointed, with A. E. Buchanan as chairman. The annual dues for membership were fixed at Five Dollars.

"The next meeting will take place at the Hotel Astor, New York, and be preceded by a luncheon for which a nominal charge will be made. All interested in the development of the new society can get particulars from the secretary at the address given above."

The Niepce Centennial

Allusion has already been made in THE PHOTOGRAPHIC JOURNAL OF AMERICA to the movement in France to celebrate this year the centennial of the invention of photography, basing the date on the work of Nicéphore Niépce. The March issue of the *Bulletin of the French Society of Photography* contains further discussion of the historical phases of the subject, and has a photo-reproduction of a letter written by Niépce May 26, 1826. This reproduction, by the way, is an excellent piece of work, and shows vividly the adaptability of such procedures for the duplication and preservation of important documents, a point that has been lately strongly advocated in the columns of THE PHOTOGRAPHIC JOURNAL OF AMERICA. French photographers are somewhat excited about the matter, as they believe that other nations are trying to rob France of the honor of the invention of photography, but there does not appear to be much danger of this. The *Bulletin* of the Society, indeed, states that the "two questions of the day" are: Who is the maker of the first photograph? and When was it made? A photograph, we are told, is the picture of an object projected in the camera, and fixed upon a sensitive surface. Davy made a picture in 1802 (by a typographic error, the *Bulletin* says 1902) with silver chloride, but he could not fix it. In 1839, Herschel discovered the fixing power of hypo, and, in the same year, Daguerre's process was made public. Through this, the art of making pictures by light passed from the laboratory into general use. The discovery of the Daguerreotype was largely the result of work by Niépce, who became associated with Daguerre in 1829.

Fouque, in 1867, and recently Potonniée, showed that in 1822 Niépce obtained permanent prints by means of bitumen of Judea. The most recent contribution to the discussion is the letter above noted. It was written to Niépce's son. It contains a request that the recipient should buy some pieces of glove-kid which he wishes to use for tampons. A second statement in the letter is that he has secured some flat tin plates for outdoor scenes.

The letter disposes of several objections that have been brought against the claim that Niépce was the originator of photography. It has been said, for example, that he was only trying to devise a method for preparing plates for engraving, and not to reproduce an image intended to be viewed directly. That the process he devised, and which he used with the camera, required a long exposure is, of course, true, but it was a photograph. The personal note evidenced in the letter gives a very favorable idea of the character of the inventor, who had the qualities which mark the true scientist. It seems that the evidence is such that our French brethren can feel justified in claiming that the first step in real photography was made by one of their countrymen. There is, however, very little occasion for such disputes, for there is really glory enough for all in the wide realm of invention and discovery. No nation and no age has a monopoly of service to human progress, and, after all, few, if any, discoveries and inventions can be pointed out in which foreshadowings are not to be found. The observation that certain silver salts are affected by light, especially in contact with organic substances, goes back at least to Glauber in the latter half of the 17th century, when Western Europe was suffering from the control of the "Merry Monarch" and "Le Grand Monarque", two despots who escaped the scaffold but well deserved it.

Reminiscences

FROM THE FRENCH

Scene: A country house artistically decorated; a large room, serving both as dining- and drawing-room, the walls bearing proofs before letters, paintings framed and unframed, photographs by various methods; comfortable without luxury; no servant in sight; time, a Saturday evening in winter.

The dinner being over, two friends seat themselves before a log fire, while the mistress of the house removes the remains of the repast.

He, 65 years old, prepossessing figure, hair nearly white, speech deliberate, with some element of diffidence.

I, 57 years old, suggestive of country life, somewhat prematurely aged, but with rather confident manner of speaking, suggesting the idea "I teach, therefore, I know."

He. Did you require some diplomacy to enable you to spend a Sunday with us?

I. I am always on the firing line, but you can always draw back onto your own heath.

He. My heath! An acre of badly cultivated garden.

I. Formerly, when we were both living in the Parisian ant-hill, you would have reproached me differently; I entered without knocking.

He. And I had the greatest pleasure at your coming. You cannot imagine how solitary I have been in a photographic sense since I have been established here.

I. I feel the same. After your departure, I found myself suddenly plunged into solitude; a solitude troubled with a sympathetic but noncomprehending crowd. At our age new friends are not made off-hand.

He. Yes. I also have lived in the remembrance of the past, yet I can say that this remembrance is pleasant. Our generation lived in constant brilliancy.

I. What things have followed each other. After the collodion process rather complex, but with a certain individuality, and remarkable in its results, we assisted at the birth of the gelatino-bromide method. What seemed more remarkable than a plate twenty times as rapid as the old plates, which, besides, would preserve its quality for years and could be developed when desired?

He. We have seen the coming-in of instantaneous photography, orthochromatic plates and color processes.

I. Two different procedures for the latter and both excellent.

He. Then the motion picture and the use of artificial light by practical processes. And other marvels may be mentioned. What will remain to be produced by those who come after us?

I. Undeceive yourself. There is no reason to suppose that the future will not be as fertile as the past.

He. It is possible, but the discoveries will be more subtle, and will not be appreciated by the mass of the people. Note what has happened in the field of physics: The discovery of radio-activity has required the mind of a Curie, more refined than that which Franklin brought to identify electricity.

I. Never mind the future; the past is attractive enough. You recall the day when a mutual friend, knowing our hobby, which was his also, took you into my den?

He. I recall it more vividly than I recall what I have done this morning. You showed me the first gelatino-bromide negatives that I ever saw.

I. They seemed wonderful to you?

He. I was astonished that a negative so different from the wet plate should give such good prints, but you must admit that they were a little yellow.

I. They were developed with ammoniacal pyro, which with the plates then furnished, gave a yellow tint, although the general result was excellent.

He. I want to ask a question. Did you not find these early plates which had a rather thick coating, give somewhat better results than those now sold, in which the coating is thinner?

I. I think so.

He. Two things struck me in comparing gelatin plates with collodion, the lower degree of transparency and the lack—though not great—of fine detail.

I. By this you have almost converted me to the use of collodion.

He. Your conversion has been of short duration, and I hasten to sacrifice to the new divinity.

I. You recall the evening, when, by the light of a candle, we prepared our "dry" collodion plates?

He. We really did discover without knowing it, Taylor's method, because we worked up a systematized division of the procedure. Rubber coating, collodionizing, silver bath and tanning.

I. The dry collodion method was wonderful, for transparencies. I still have some which are beauties.

He. Care is, however, needed to get good results.

I. Dread of hypo was the beginning of wisdom.

He. With a tithe of the care that the old processes required, one can obtain very acceptable results by the modern methods. This care you taught me, and I am still sensible of it, for I have applied the principle in other affairs of life. I think it one of the things that ought to be taught as part of regular education. Think what the race would be if carefulness had been the practice through all the past.

I. It is better not to think of such things after the years of ravage through which we have just passed. Let us talk of something else. Does it not seem to you that we have degenerated in some respects? For instance think of the many shutters that were brought out in the early 90's.

He. Why, I have an old time-exposure shutter, that is very simple and convenient, which you could not now find in the market, especially for what it cost me.

I. You showed it to me once. Wonderful.

He. You would not have spoken so at that time.

I. The Academy did not take that road!

He. On the other hand, we now have wonderful developers. Would you have thought that there could be developers that are exchangeable and serve for different degrees of exposure?

I. I have believed it only after I tried them. I felt, I admit, like thirty cents.

He. Oh, you anticipate this time the ever-to-be-remembered decisions.

I. Then the objectives. The trademark titles ringing the changes on jargon. Yet formerly I could get an objective for seven francs that would give a good picture.

H. But you did not work at the hundredth of a second under an umbrella!

I. My criticism is not fair, because the development of the optical side of photography has been one of the marvels which we have witnessed. I have often thought how the invention of plates of a speed, say ten times that of the present ones, will change the condition of things. Our old "rectilinears" served our purposes.

(The housewife, standing near the fire with some work, joins in the conversation.)

I have no need to ask of what you are speaking. It is not the Polish problem or the coming elections. Do you know how my husband passes his winter evenings?

I. I know that he does not care for politics or gaming, but I see that he does some gardening and looks after the live-stock.

The Wife. You are wrong. He reads and re-reads the old photographic manuals. He has some from 1875. He looks over the old catalogues, issued by houses long since gone out of business. He looks over the old negatives and old prints. He has an upper room filled with these.

He. Tomorrow I will show these to you, and (whispering) we will do some wet collodion work. I have everything ready.

Over-Printed Bromides

The best way to deal with over-printed bromides is to consign them at once to the waste box and correct the error by a fresh exposure. But it is not always convenient to do this, the fault only being discovered when the prints are dry, and then at a time when printing or enlarging is not practicable. Moreover, if the print is fairly large, the cost of the paper is a consideration, and it is worth while trying to save it.

The most obvious way of doing this is to employ one of the standard reducing solutions, as used for negatives, of course in a highly-diluted state, as the delicate image of the print would be quickly dissolved if a strong solution, as is used for negatives, were applied. Bleaching-out the image and re-developing has found some advocates, but in our experience the results so obtained have not been comparable with a print properly exposed in the first place, the effect being that of an over-exposed and under-developed print, if the development has been cut short, while practically a return to the original state comes with full development. A process of reduction, if carefully carried out, offers the best chance of success, and should not affect the color of the deposit.

There are several formulæ which are suitable, but none which will bring very dark prints to a normal depth, as these are apt to become harsh under treatment. We, therefore, assume that only a moderate degree of reduction is necessary.

Before going farther it is worth remembering that a strongly-acid fixing bath, especially one fairly charged with amidol developer, has a considerable power of reduction, so that if dark prints are left in it for half an hour or more they may be lightened to the desired degree. This action is not equally strong upon all brands of paper, so that experiment is necessary before relying upon it.

Of the standard reducers there is none so satisfactory as a mixture of iodine and cyanide, which works evenly and does not affect the color of the image. In deciding upon a working strength, we have here also to study the nature of our paper, or we may find that our image is damaged beyond reparation before we can stop the action. Two stock solutions should be prepared, one being a ten per cent. solution of iodine in iodide of potassium and the other a ten per cent. solution of potassium cyanide. The normal reducer for negatives is made by adding thirty minims of the iodine solution and five minims of the cyanide to each ounce of water. At this strength it may be used for cleaning up margins, or for quickly removing any unwanted portions of the image; for general reduction it should be diluted with two or three volumes of water. It should be noted that the energy of this reducer depends upon the iodine which converts the metallic silver forming the image into a salt which is readily soluble in the cyanide, so that increasing the strength of the cyanide has little effect. The solution may be used in a dish, but in practice it is more convenient and economical to lay the print upon a glass plate or

the upturned bottom of a porcelain dish, and to apply the reducer with a swab of cotton wool. By so doing, not only can a certain amount of local control be exercised, but, as only a small quantity of solution is present, there is little risk of running over the desired point. Five minutes' washing is ample after using this intensifier.

The well-known ferricyanide and hypo solution may be used in the same way, care being taken that only enough ferricyanide be used to give a very pale yellow color to the mixture. The hypo may be rather stronger than is sometimes recommended, a ten per cent. solution being a good working strength. A plain, non-acid hypo bath must be used, and the ferricyanide should be freshly dissolved. These precautions will obviate the stains which sometimes occur. If used in a strong light the mixed solutions rapidly become decolorized and inert.

A convenient method for use with large prints is that of successive immersion in a weak solution of iodine and hypo solution. To enough water to cover the print well is added the aqueous solution of iodine, previously mentioned, until a deep straw tint is obtained. The print is laid in this, and the dish rocked until the blue color, which immediately appears on the back, is visible in the high-lights of the picture. After rinsing, a twenty per cent. hypo bath is applied, and allowed to remain for at least ten minutes. If the reduction be insufficient, the whole process may be repeated, after thoroughly washing, any trace of hypo being sufficient to stop the action of the iodine.

Prints which have been toned by bleaching and sulphiding, or which have been thoroughly toned with hypo-alum or liver of sulphur, can be reduced with the iodine-cyanide solution, but as a rule the tone will be rendered rather warmer. A much stronger solution may be used than is permissible with black-and-white prints.

When contrasty effects are desired from thin negatives, it is sometimes advisable to over-expose deliberately, to over-develop, and then to "clean up" by one of the methods given. This is especially valuable with line subjects which have a tendency to print through. Quite a deep grey tint may be removed and the lines still left of greater depth than would be possible with simple exposure and development.

We have lately handled some samples of paper which did not allow of the film being rubbed with cotton wool while wet. If such are encountered, the reduction must, of course, be carried out by immersing the print and keeping the dish well rocked.—*The British Journal of Photography.*

Effect of Color Contrast

The effect produced by placing certain colors, in contrast with each other, is due to a physiological peculiarity of our vision. It is really a deception of our judgment and has a marked influence upon the character of the object, viewed under such condition.

The intensity of the contrasting colors is always influenced by the amount of white light present. No contrasting colors develop fully when projected upon a perfectly black surface. Contrary to our expectation, we find that colors, which are not full, that is vivid, which incline rather to the darker tones, exhibit the phenomenon more pronouncedly.

This is what is interesting to the photographer and explains why the mount for his picture must be selected from neutral tones instead of full tones (positive tone). He has found by experience that the effect is bad upon the tone of the photograph when the mount is a decided color. Full colors force their hues so decidedly upon the vision, that no chance is given for simultaneous contrast with the tone of the picture.

Broken colors play a particular role in artistic mounting. The effect is not fatiguing to the eye, but restful—for they produce, as it were, an insinuating effect and give occasion to a pleasing illusion.

The necessity of the admixture of some white light as a means of diminishing fullness of color, which practically reduces the full color to a neutral tone of that color, is easily demonstrated. If you cut out, of black paper, a small disk and superimpose it upon a sheet of positive color paper and look intently at the image we get, at the best, only a faint impression of the contrast image when we direct our vision quickly to the background. But if we first place over the full color background a piece of thin tissue, so as to transform the full color into its neutral tint, and then do the gazing, we instantaneously get the full contrast effect.

Now in photography we do this very trick, substituting only the black and white photo-print instead of the piece of black paper disc. This fact supports the contention that the photographer must study the character of the mount, as far as tint

of color is concerned. Black, for instance, upon neutral violet, shows strong tinge of yellow-green, if the black is glossy, but it is not so strong if the disk is matt surface. Green, blue and violet, the so-called cold colors, in this way originate strong contrast, but the reds, yellows and yellow-greens are not as pronounced in their effect.

Fashion seems to a dictate taste more than scientific experiment in judgment of the mount, but there is a practice of indiscriminate employment of the dark mount, irrespective of what effect it has on the picture.

Methods of Toning P. O. P. Without Gold

There is no doubt that gold chloride is the best agent to employ in toning printing-out papers. It is comparatively simple, acts readily and uniformly and affords a most pleasing variety of rich tones, but the cost of gold has induced experiment with a number of chemical bodies with a view of securing tones approximating those had with gold.

Some of the formula proposed afforded excellent results, that is, as far as color is concerned, but no surety of their permanence, indeed, many of the salts used are really contributory to a speedy deterioration, not only of the toned image, but of the photograph itself. Lead salts seem to belong to this class of toning agents. So despite their ability to afford pleasing tone, it is not advisable to employ them if the question of permanency of the print is under consideration. Trapp & Münch recommend sulphur toning for slightly over-exposed prints. The copy is first well washed in several changes of water, then immersed for twenty minutes in hypo solution (1-10), again washed for half an hour in running water and toned in the following bath:

Hypo sulphite soda.....	1½ ozs.
Water	32 ozs.
Solution sodium sulphide (1-100)	2 to 3 drams.

The prints tone rapidly and attain the desired color in about a minute, but the formula does not give reddish brown or violet tones. A final good washing is demanded.

Barium sulphide has also been recommended: 32 ounces water and 15 grains of barium sulphide are shaken up and then let stand, the clear, supernatent liquid is poured off. Take of this clear part 4 ounces and add it to a solution of 2 ounces hypo in 32 ounces of water.

Trapp & Münch for matte surface prints recommend the following:

The well washed somewhat over-printed copy is placed in a ten or fifteen per cent. solution of hypo for five or ten minutes, then thoroughly washed and placed in

Copper sulphate	150 grains
Water	25 ounces
Common salt	30 grains

where it bleaches.

It is next well washed and in full daylight redeveloped in

Sodium sulphite (gran.)...	90 grains
Water	20 ounces
Amidol	30 grains

The tone varies with the content of the sodium sulphite. The more of the sulphite the browner the tone; the less of sulphite, the more the tone approaches blue-black, but the amount of sulphite must not be less than 60 grains or the whites of the print suffer. On completion of tone, the print is washed and put in meta-bisulphite solution for 3 minutes (one part to fifty of water) and left to lie for half an hour, during which it should receive frequent washing under the tap.

Extreme Intensification

Professor R. Namias has recommended a process of intensification suitable for the utmost degree of intensification and contrast such as is required in rendering visible traces of impressions obtained in the photography of suspected documents. The negative is first bleached in a bath of two parts potass permanganate and 20 parts hydrochloric acid in 1,000 parts of water, rinsed and developed in ordinary M. Q. The object of this treatment is to yield an image specially susceptible to intensification. The negative is then bleached in the usual bath of mercury bichloride and darkened with a developer. Next follows treatment with a bath of mercuric iodide compounded from two stock solutions:—(a) Mercury bichloride, 3 parts; hydrochloric acid, 1 part; water, 100 parts; and (b) potass iodide, 5 parts; water, 100 parts. Solution (b) is added little by little to solution (a). A red deposit of mercuric iodide is first formed, the addition of (b) being continued until the mixture just becomes clear. On treating the negative, which has been intensified with mercury and well washed in this mixture, the progress of further intensification can be followed by transmitted light.

The action of the bath is stopped as soon as it is seen that no further increase in density is taking place. If a still greater degree of intensification is desired, the negative may be subjected twice in succession to the treatment with the plain mercury bleach and redevelopment, but once the plate has been acted on by the mercury iodide mixture it is not susceptible to further chemical treatment. It may reasonably be thought that it has not done so badly as intensifiers go, in this respect; but Professor Namias explains that the process is designed for a degree of intensification greater than is commonly required. Moreover, as the intensified image is a brown color, still further contrast may be obtained from the negative by printing it through a violet screen such as may be made by soaking a fixed and washed plate in 1 per cent. methyl blue solution.—*British Journal of Photography.*

Plain Paper for Pictorial Purposes

Control in the making of the picture is the great desideratum of the pictorialist, but in the majority of cases the photographer is constrained to use media for positive work, to exploit his individuality of expression, the constitution of which he is entirely ignorant. He is compelled to work, in a great measure, by rule of thumb, and to adapt his method of manipulation to exigencies of imposed conditions. In past times, when he made almost all his products by personal experience, he could temper conditions to his liking, and prepare media to exploit any particular feature desired, notwithstanding those days were not distinguished, as are the present, for high, artistic effort. The inference is allowable that pictorial work, as estimated at present, might be less hindered in the performance if the media were under the same control as aforetime.

We are not singular in this notion, since we are aware that so many pictorialists are now turning their attention to carbon work in which control is paramount.

But there are other old methods, equally valuable, which might be advantageously resurrected and here we present one which we feel sure would be welcome to the pictorialist for the latitude it affords for personal expression. A variety of plain, salted silver paper is here offered, which is adaptable to the character of negatives now advocated by pictorialists.

It is effective, simple and inexpensive, with many special advantages all its own, giving rich and varied tones with brilliancy of high-lights and clearness of shadows. Whatman's drawing paper, of good body (heavy) is preferable. First make:

Pure Sodium Chloride .... (not table salt)	150 grains
Ammonium Chloride	100 grains
Potassium Bichromate	4 grains
Water	20 oz.

If the negative is very thin, increase the content of bichromate, or if dense, reduce it. Immerse the paper in this solution until it lies flat. Dry thoroughly and mark one side in the corner of the sheet.

Sensitize the marked side by carefully floating, for 2 minutes on the following:

Silver Nitrate	400 grains
Citric Acid	150 grains
Distilled Water	10 oz.

Be careful to avoid air bells. Turn up from one corner the sheet and if any bubbles show, prick them with a point. Draw off surplus fluid at one corner and hang up to dry in the dark.

The surface is a beautiful primrose from the slight amount of silver chromate formed. Printing and toning is done as with ordinary P. O. P. The advantage over most prepared papers is in the good keeping qualities of this paper.

Effects from Manner of Printing

It is somewhat of dispute whether the results obtained by printing the same negative in sunlight, direct, or in the shade, are materially different. But undoubtedly there is a difference when one negative is thin and the other dense. The result from a thin negative is better when the printing is effected by exposure to a comparatively weak light. This is the experience of every practical worker.

The general consensus of opinion is the preference for prolonged printing, irrespective of the character of the negative employed. The subject, by the way, is an old time one.

We call to mind it was a discussion of periodical occurrence at photographic clubs in the past, but we must remember that the almost universal printing media in those days was albumen silver paper. Now we have numerous other media and silver albumen is relegated to desuetude. Papers,

too, are now used, the nature of which the average photographer is woefully ignorant of, and so the resolution of the question implies certain reservations before a decided opinion can be ventured upon. First of all the color of the image desired must come into the consideration.

The color must be in a great measure influenced by the method of printing. Anyone may verify this simply by exposure of two pieces of the same kind of printing-out-paper; the one to the influence of feeble light, the other to action of strong light (sun direct), and comparing results. The piece of paper subjected to weak light, prolonged exposure in the shade (printing in both cases; to the degree to bring the image to about the same depth), will be found to give a rather cold tone, while the piece printed in the sun (short exposure) shows a much richer tone.

But this is not all. In the operation of the toning, to which the respective prints are submitted, the gold seems to be differently deposited and presents optical difference.

This would seem to substantiate the contention that intensity of light is really a factor in securing tone color. Another factor in influencing color may be mentioned, that is the presence or absence of moisture in the fibre of the paper during the progress of the printing.

The hygrometric state of the paper seems to affect chemical action during the exposure, as might be expected. In the old printing process, it was a well-known experience that results were different with damp paper and with paper in what was called the bone dry condition, and we have found difference, too, with ordinary P. O. P., as it comes out of the package and when it has been submitted to moist atmosphere before printing.

Some kinds of paper are purposely kept in receptacles containing a desiccator (calcium chloride), which absorbs moisture of the atmosphere, and every user of such paper knows how materially different are the results when the sheet is used immediately on removal from the tube, and when the print is made upon a piece which has been lying exposed sometime to the air to take up moisture therefrom.

Platinum printers sometimes place a damp pad in the printing frame with the exposed sheet to get a desired tone. Aqueous vapor undoubtedly has influence in chemical action, and why not in the process of printing.

Speed in Photography

A. E. SWOYER

Nowadays, in photography as in everything else, the cry is for speed; one hears little else but talk of fast lenses, fast shutters and fast plates—the slogan of the modern photographer seems to be, "If you can make an exposure of a thousandth part of a second, why use more time?"

To meet this demand the various manufacturers are performing miracles in the way of lenses working at *f*2.5; plates with a speed number of 500 H. & D. and shutters guaranteed to cut exposures down to 1/1500 or 1/2000—which is a very good thing for the photographer and not without profit to the manufacturer. Unfortunately, many photographers do not realize that the terms "speed" and "fast" mean different things when applied to lenses and to plates, for example; and often as a result of this ignorance, combinations are made in which one element hampers the efficiency of the other, or oftener yet, in which the purposes of the user are thwarted.

It must be understood that one lens is faster than another simply because it will form a sharp image while working at a greater opening than the other—or, in other words, that it will admit a greater quantity of light in the same time. Obviously, this has nothing to do with speed in so far as stopping motion is concerned, but simply means that with a fast lens photographs may be obtained under conditions of light that would make work with a rectilinear impossible; such a lens lengthens the photographer's working day, but does not particularly enlarge his field.

Then, one plate is faster than another because it is more sensitive to light and will therefore record an image in less time or under more unfavorable conditions. Such a plate may compensate for some of the deficiencies of a slow lens, or it will increase the efficiency of the anastigmat in permitting photographs in dull lights—but once again it has nothing to do with stopping motion.

Finally, we have to consider the speed of shutters, which has to do solely with the time during which the light is allowed to act—and hence the ability of the outfit to stop motion depends upon the shutter rather than upon lens or plate. To sum up, the lens fixes the amount of light admitted; the speed of the plate determines whether that light is sufficient to form an image; the shutter speed fixes the least

period during which the light is allowed to act.

So, you see, there are a number of possible combinations, any one of which may—or may not—do the work that you want it do do. You may think to be able to make speed pictures by fitting your regular shutter with a fast anastigmat—and find that although you can make pictures in poor lights, you can't stop motion any better than you could with an old piece of window glass. Or, on the other hand, you may have figured that a shutter working down to the one-thousandth part of a second would do the trick in conjunction with your rectilinear lens—and then found that although the shutter was capable of freezing a mile-a-minute automobile, your lens would not admit enough light during that short period to form an image on the plate. Perhaps you had the lens-and-shutter combination calculated exactly, but handicapped them with a plate so slow that although the image and the light were both there, the plate was incapable of recording them.

At any rate, if you are after speed pictures—the racing autos and the jumping dogs that the lens men are fond of showing—you must procure the utmost speed in all three items. And even then you won't find the outfit altogether satisfactory for general work, although it has cost you a tidy sum, because the fast lens has a shadow field and unless you stop it down to about the speed of the rectilinear, it will reduce both foreground and background to fuzz; the speed shutter (in some makes) will tend to underexpose the corners of the plate or, if a focal plane, will give you egg-shaped wheels on your racing car when you photograph it, owing to the sectional exposure; and you will find that the fast plate has little latitude, and is strong on coarseness of grain and tendency to fog during development. Of course, the fellow who is doing that kind of work right along recognizes and expects these difficulties; if you are a speed fiend, that is the kind of outfit that you will have to have anyway.

But if your general work is not of this sort, and you simply wish to be prepared for fast work should the occasion arise, you will find a modification of the straight speed outfit that will suit all purposes. A lens working at *f*6.3 or *f*6.8 is fast enough to permit of speed pictures under fair conditions of light, and a shutter with speeds down to 1/300 or thereabout will stop any ordinary motion. With such an outfit you can use the slower plates for regular work, and obtain their advantages of latitude, fineness of grain and ability to render tone value—yet you can handle anything save the extreme speed problems.

Then, of course, lots of us do not care so much for the jumping horse or the tennis ball in the air game; if we can fix our outfit so that we don't have to dig up a tripod every time the sun goes under a cloud we're satisfied, so it is plain that we do not absolutely *have* to buy a one one-thousandth of a second shutter. A lens of large aperture will do the trick for us, and our old shutter will handle such ordinary work as we wish to handle with neatness and dispatch; in fact the writer uses an outfit of this sort for regular field work, because the anastigmat—while giving microscopic sharpness—may be used to suppress obtrusive details in background and foreground if opened up to just the proper degree, while depth of field and other details may be managed by judicious "throttling down." Incidentally, while with ordinary plates and the fast lens you can go on working long after the other fellow has quit for the day, this same lens will allow you to use the slower, cheaper and often better-in-some-ways slow plates for average exposures.

The new plates, too, offer an advantage for this sort of work—and will do so in even greater degree with the constant improvements that are being made in the emulsions with which they are coated. More than one of us sleeps with a lens catalogue under his pillow—but can't quite reconcile himself to parting with the necessary $50 or so to become the owner of the lens itself; for such a one the fast plate offers a substitute as far as working in poor light is concerned. Suppose, for example, that we desire to increase the speed of our outfit to such an extent that we can make snapshots on dull days—our first thought is to substitute an anastigmat working at *f*6.3 for our *f*8 rectilinear, thereby doubling the speed, and parting with a snug bit of change in the process. Without any attempt to decry the anastigmat, couldn't we produce exactly the same result, say, by using an extra fast plate instead of a standard plate of half the speed—and do it for a difference of but a fraction of a cent per plate? Right here I can hear a number of fellow-photographers remark, "Why not use the anastigmat *and* the fast plate, thus quadruple the efficiency of the old outfit?" This is very true, but we are supposing that it is desired only to double the speed—the

term being used in connection with working in adverse lights and with no reference to the photography of rapidly moving objects —and we therefore have a choice of either of the two methods.

To sum up, the idea which this article is intended to convey is that the choice of a speed outfit should be tempered with judgment and with an understanding of what we mean by "speed"—together with a consideration of the amount that we feel able to put into such an outfit. For the photographing of rapidly moving objects under all sorts of light conditions, the highest speed of shutters, lens and plate is none too great, for if it is not needed in the work of one day it is still available as a reserve, and the next occasion may tax it to the utmost. For a general purpose outfit, capable of handling everything but extremes of speed under reasonable conditions, the *f*6.3 anastigmat and shutter working down to 1/300 will prove adequate; while the man eager simply to increase the efficiency of his camera as far as poor light is concerned would find his answer in the anastigmat mounted in his ordinary shutter, or in a lesser degree, but at a negligible cost, in the use of fast plates with his regular outfit.

In short, when you buy such an outfit, remember that lens, shutter and plate each perform a separate function, and that only by considering these functions in connection with your requirements can you secure the utmost efficiency in each, separately or in combination.—*The Camera.*

After-Toning of Bromide and Gas-Light Paper

Of the many methods for after-toning of bromide and gas-light papers a preference seems to be for that which is called sulphur toning, which gives a wide range of tone from red to deep sepia. The formulae for getting blue, green and other tones by combination of iron and uranium seem to be of practically little consideration, by reason, perhaps of the want of constancy of the tone and the liability of encountering failure, irregularity and presence of double tones on the print.

These uncertainties are traced to the sensitiveness of the chemicals to atmospheric influence. These effects may in a measure be overcome by coating the toned print with wax solution or other agents to exclude action of the air.—*Photo Rundschau.*

Recent Patents

1,390,983. Color-Cinematography. The method of printing an image in accurate position upon sensitized means comprising projecting a beam of light through the image and thence through a focusing lens to form a projected image on the sensitized means, and deflecting the beam intermediate the lens and one of said images to secure said accurate positioning.

1,392,312. Photo-Printing Device. A photo-printing device comprising a frame, a cover hinged thereto, a stamping member set in said cover, and means to operate said stamp as the cover is moved to closed position, comprising a rigid lever mounted on the frame having sliding connection with the cover and adapted to engage a portion of the stamp to depress the latter.

1,391,990. Portable Cinematograph-Projector. In a portable cinematograph-projector, a casing, a series of separate compartments in the casing, projector mechanism in one compartment at the front of the casing, a take-up spool in a rear compartment, an illuminating device in a compartment between these two compartments and a channel connecting the front and rear compartments through which the film passes from the projector mechanism to the take-up spool.

Bettering Faded Prints

H. S. C. writes to know of some way to restore the faded image of an ancient silver print, in order to copy it.

Faded silver prints are in frequent evidence for restoration. We can give no warrantable method to intensify the faint image, inasmuch as time seems often to have totally obliterated even a faint substratum.

In some cases we have found the following plan to work tolerably well; Soak the print from the mount; then make the following:

Mercuric chloride	10 gr.
Citric acid	15 gr.
Water	1 oz.

Bleach the image in this wash thoroughly and then develop with ferrous oxalate.

A.

Sulphate of iron	4 oz.
Water	16 oz.
Sulphuric acid	1 dr.

B.

Oxalate of potassa	4 oz.
Water	16 oz.
Oxalic acid	30 gr.

Take one part of A to four parts of B. Be sure to add A to B, not B to A.

Proportionate Effect

The term tone is sometimes employed in art parlance as if it were synonymous with harmony. This is probably due to the unfortunate confounding the terms, tone and gradation of light and shade. Besides, art writers in photography sometimes leave us in doubt whether they mean "tone," as the painter interprets it, or merely the color of the photographic picture.

Tone, gradation and harmony are quite distinct pictorial qualities, though most intimately related. Tone, however, is dependent upon proportion rather than on intensity, so that we have high and low tones in a picture and harmony in both kinds.

In the photographic picture we do have tonal values dependent upon proportion and gradation rather than on intensity.

Light and shade gradations are the essentials for harmony in a picture by the camera, and unless these gradations are properly managed, there is danger of misrepresentation of the original, particularly if there is not much differentiation of the various pictorial planes. And we do frequently see this apparent falsity to nature in an impressionistic photograph, where the softness is due to mechanical means instead of being a transcript of nature's impressionism. The faked picture may have the proper amount of light and shade in a low tone, but no harmony because it does not have the proper gradations.

In nature there is, under certain illuminations, infinite gradation, and the artist tries to catch the ratio in his picture, otherwise he does get a hard, level impression instead of a soft one.

In the picture all the different component elements, the various areas of light and shade, must be brought into proper relation with each other—"each to each by proper rendering." Each must receive its due proportion of light and shade. In a portrait, for instance, the light on the nose, chin and forehead must be in right proportion to the shadows on the side of the face, the neck and bust. You must try to get this proportional effect whatever may be the character of your picture; portrait, landscape, interior, genre, still-life, etc. In portraiture, the dress or drapery is apt to give the leading or predominant tone to the picture, and so keep the parts duly balanced and artfully distributed.

Dark costumes are managed more easily than light draperies, because the contrasts are greater and we can oppose them agreeably to the brighter tints in less number, and thus secure depth and rich effect. But with expenditure of more skill, the artist gets charming effects by arranging a white dress against something a trifle deeper in tone, as a background. The high tones in such a picture are both slightly differentiated, flesh, drapery, background in right proportion, and very delicate in presentation. But it takes skill or you get unpleasant flatness. You may need, at times, a decided touch of higher tone somewhere to give the key to the harmony by its contrast. A rose in the hair or some object held in the hand of the model as a note of animation.

But keep in mind that there is more chance of failure in a struggle to make the picture brilliant than there is in the natural yielding to simplicity of effect, but never court tameness, which makes a picture insipid.

Deception in Regard to Color

Our vision is liable to be deceived by color in very much the same way as it is in regard to the actual form and size of things, the mind having much to do with our impressions. This has been well set forth in the book "Visual Illusions" (Mr. Luckiesh), and some information relative to the mingling of sense impressions, with logical conclusions or with impressions due to memory, may be a prolific source of error to the photographer who is after a true conception, while at the same time this psychological idiosyncrasy may be helpful in giving a more realistic presentation of the natural thing. So it works both ways.

A knowledge of these deceptions of the judgment is of particular value to the artist and to the pictorial photographer, and the instances of deception as to form and size are analagous to those relating to color. The deception in regard to fullness of color is that most dangerous to the inexperienced. Full colors are very seldom met with in nature. Even those objects which, in reality, possess very full color, exhibit it but seldom, and only under certain definite conditions. They cannot show it unless illuminated by the glare of sun or in light of their own color, and besides, there must be absence of superficial reflection. It is necessary, at the same time, that the layer of air, which intervenes between the eye

and the object, should be of only moderate thickness.

These various conditions are seldom complied with, all at once. But still we generally endeavor to discern the true color of the objects seen, that is to say, that color which would be shown if the objects were close by us under favorable conditions of illumination. We therefore accustom ourselves, when forming a judgment, to take into account, quite unconsciously, all the circumstances which interfere with the impression made by the color, and consequently imagine that we see the object in its proper hue, even when this cannot possibly be the case.

In a picture of distant trees, the beginner in painting invariably has them in too vivid green, because he knows that they are green, where actually they are neutral grey. He will tell you he paints just what he sees, but he in truth is painting what he knows —or what his memory suggests. The photographer, to be sure, does not delineate in color (unless he uses autochroms), but his memory plays the same tricks with his eyes and he judges in false values. These deceptions are not confined to open air experience. An inexperienced eye thinks that it sees the hangings of the same color, whereas if the observer would stop to think, he could readily convince himself that the shades must vary according to the light under which they are seen. All this is of value to the photographer, who translates color into monotone values, because the lens and plate are not mentally mislead, and if due consideration is not taken for human idiosyncrasy, accuracy of rendition may, at times, seem to record what is false, what does not look true to our eyes.

The Platinum Outlook

The enormous advance in the price of platinum in recent years has embarrassed chemists, photographers and several industries. There seems to be no prospect of material reduction, although since the close of the war some fall has been noted. The Russian sources are being more actively worked, and much attention is being given to the Colombia mines. American companies are taking steps to explore all possible sources in that country, which is the locality of the discovery of the metal. Search has been made in many parts of the world for platinum deposits, but little result has as yet been obtained. Some encouragement has lately been reported from Alaska. The high price of the metal has diverted it into extensive use in jewelry, which is now absorbing more than half the product. George F. Kunz has recently furnished some statistics on the question. The consumption in the United States in 1920 was nearly 150,000 troy ounces, of which 57% went into jewelry, and most of the remainder into dental and chemical work. Presumably, the amount employed in photography was small compared with other uses. Should the price fall below that of gold, the use of the metal in jewelry would be practically abandoned. Fifty years ago crude platinum sold at less than ten dollars per troy ounce; during the past few years it rose about one hundred dollars for the same weight, thus making it about five times the price of gold.

New Desensitizers

The great interest that has developed in connection with the phenosafranin method, has naturally led to attempts to find other substances which have similar properties. Lumière and Seyewitz tried many organic substances without finding any that had quite the merits of the original. A summary of their results appeared in the leading photographic journals, and the more important points were presented in an article in the July (1921) issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA. The most important point discovered by this research was the desensitizing action of aurantia, a yellow dye, which, however, does not have the comprehensive effect of phenosafranin. A solution aurantia in acetone was put on the market by the discoverers of its action, but it is irritating to the skin, and has not found much favor.

According to a recent issue of *Photographische Industrie* a new substance has been produced in the laboratory of the Höchst dye-works, by Dr. E. König, which is termed "pinakryptol," but concerning which as yet no information is given as to composition or method of manufacture. This secrecy is frankly stated to be due to the liability to competition by other countries. Dr. Lüppo-Cramer has tested the material, in fact, two substances have been submitted, the second termed "pinakryptol green." It appears, however, that these new substances seriously delay the development; they have the advantage of being easy to wash out of the gelatin. Phenosafranin is more resistant. Pinakryptol is also but feebly soluble in water. A solution

of 1 part in 5000 is advised, and this is not very easy to make. Lüppo-Cramer does not regard the pinakryptol as a formidable rival of phenosafranin, but does think that the other substance, namely, pinakryptol green, may be favorably received. As he has no financial interest in the matter, he is not worried. This color is more soluble than the other and as active a desensitizer. Further information will be awaited with interest.

Canadian Pictorial Photography

During the month of May The Camera Club, New York, exhibited a special collection of pictorial photography composed of work by Canadian pictorialists, and representive of the Dominion's photographic art. This is the first time such an exhibit was ever sent to this country, embracing, as it did, specimens of the style, methods and results of a whole, vast territory.

Much of the work was excellent and all very creditable. Many of the foremost Canadian photographers included their salon pictures. The centers specially represented were Toronto, Montreal and Winnipeg.

The show attracted much attention and elicited very favorable comment; and our Canadian neighbors will henceforth be reckoned with by Americans at all the exhibitions, I am disposed to predict.

A description of the various outstanding prints would, I fear, only confuse. It is hoped that a number will be reproduced in the future, which will afford a better idea of their excellence. To mention a few of the best, I will enumerate the following: "Bliss Carman," by M. O. Hammond, Toronto; "Portrait"—one of an elderly man, another of a child—by W. A. Rockwood, Toronto; "Early Morning—Quebec Harbor," by Albert Kelly, Toronto; "In a Calm and Quiet Bay," by Russ. M. Collins, Secretary Toronto Camera Club; "A Sunlit Glade," by J. Addison Reid, Toronto; "Moonbow Trail," by A. R. Blackburn, President Toronto Camera Club; "Sun Patches," by A. Van, Toronto; "The Mountain Stream," by M. V. Mills, Toronto; "Melting Snow," by Alf. Brigden, Toronto; "Portrait," by Charles Aylett, Toronto; "John Drinkwater," by Alfred S. Goss, Toronto; "Study," by Will D. Moore, Winnipeg; "Canadian Winter Landscape," by B. B. Pinkerton, Montreal; "Gipsy Wash Day," by Ernest Hoch, Toronto, and "Approaching Storm," by J. H. Mackay, Hon. Secretary of the forthcoming Canadian National Exhibition, to be held at Toronto, August 26 to September 9, 1922, which will include the thirty-first annual salon of the Toronto Camera Club. The last date for receiving exhibits will be July 29, 1922. Entry blanks may be obtained from Mr. Mackay, No. 2 Gould street, Toronto.—FLOYD VAIL, F. R. P. S.

"Materia Photographica"

It is essential that the photographer should have acquaintance with the various chemical agents he uses so as to intelligently apply them in manipulation, but it is not necessary he be a chemist. Hitherto this knowledge has not been collectively possible, and recourse had to be to the special scientific books when any information was wanted and with only partial enlightenment, by reason of the lack of special education in the science. Therefore, the more welcome will be the publication by way of detachable sheets each month in THE PHOTOGRAPHIC JOURNAL OF AMERICA, relative to "Materia Photographica." These collated sheets will form a valuable means of reference and a trustworthy source of information, communicated in a way intelligible to the practical worker in photography.

The subject is handled in an admirable way by Alfred B. Hitchins, Ph.D., F. C. S., Director of Ansco Co.'s Research Laboratory, with consideration of the limitations of the photographer. These sheets may be removed and filed from month to month, thus forming an excellent and handy dictionary of the various chemicals and raw materials used in manipulation.

Extravagance in Individual Expression

The old manner of judging pictorial expression in photographs is fast giving way to a wider conception of what is possible with the camera but in this broadening of our ideas we must steer clear of the tendency of the times of running in extravagance, for the mere purpose of sensationalism.

We are asked what is a picture? Is it not essentially a reproduction of nature, even though it be a product of the wildest fancy? Truth is the report of nature by the artist, and depends upon the ability of the reporter to perceive what is true. He, of necessity, is influenced by his temperament, and so the report varies. We are told that the aim and purpose of pictorial art is to present an illusion and how is this

reconcilable with the contention that art is truth?

Can a thing deceive us and at the same time be veracious? Yes, art can and does, and the aesthetic sense is grateful.

Art truth is the suggestive method of dealing with facts. Art never falsifies, but it selects and emphasizes certain features of reality and subordinates other features. The spectator must do his part as well as the artist, and there is a mutual satisfaction. Unless the artist permits this collaboration, he is found dishonest at the tribunal of art.

Each art has its individual method of translation, and pictorial art presents the illusion by rendition of values, or in other words, the representation by means of light and shade and color of the material significance of form.

We have an impression given to us through our eyes to our mind. We have projected figures and things illuminated in infinite variety of tonal values. It is our purpose to transfer such to our picture that it will communicate, to others, what effect the subject had upon us, and so we are constrained to be sincere and give our personal report, so that the beholder may understand our motive. But the pictorialist is, at times, false to himself and dishonest to his client, when he tries to do too much.

A picture is really defective when it performs imperfectly what is the special function of some other art. It is affectation to talk about symphonies in color, or nocturns in light and shade, although there is, in truth, such a thing as harmony of color, but it can never do what musical harmony effects.

Although we say "the picture tells a story," we do not judge the picture for dramatic effect.

Every picture depends for effect upon the impression it makes, and sometimes we find the interpretation we made of it is corrected by the catalogue, but this does not imply that the picture is not a work of art. The photo-pictorialist must select from the many possible variations of illumination or differences of arrangement of things, just what shall best convey to the visual sense the illusion that things are in space.

In our initial study of art, we get possessed of the notion that a picture is a *fac-simile* of nature, but after awhile we see that there is, in all good work, a difference in the work from the same subject in the hands of any two artists, and this difference results from the individuality of the artist, even if both use the same camera at the same instant.

The painters used to ridicule such a contention as preposterous or presumptuous, or worse, but they now are compelled to admit and the honest ones do.

Vignetting Negatives—Glass or Film

A. J. JARMAN

There are a number of ways of making a vignette, either by cutting an oval or an ellipse in a piece of cardboard, and cutting around this a number of spikes alternately, placing this upon the printing frame, covering the irregular hole with a piece of tissue paper, to cause diffusion of the light. This is a very old plan, but thoroughly effective. There used to be glass plates made for vignetting that presented an oval in clear glass in the center of the plate, and gradually blended in yellow and orange to ruby ringlets to the outside, which used also to answer the purpose.

Another plan, that used to be employed and is still brought into use, is the packing of absorbent cotton around the part to be vignetted, cutting off the action of light from all parts except where the head and bust were to be printed. Usually a piece of cardboard was tacked upon the front of the printing frame, and the cotton packed between this and the part of the negative, a rough hole being cut in the center of the cardboard to admit the light, this hole being covered by a piece of tissue paper.

A plain glass plate may also be taken, and a piece of tissue paper pasted thereon, after cutting a hole in the center of suitable shape. Then stump in all around the central hole with any kind of opaque, so as to produce the right shading, which may be easily tested with a piece of P. O. P.

The most simple method of all, and one that is almost universally employed, is made up as follows:

The negative to be vignetted is placed in a printing frame and a piece of cardboard cut the size of the outside of the frame, with a hole cut out in the center, which must be larger than the vignette required. The hole for a portrait may be cut pear shape. This is the shape that is suitable for most vignettes. Then paste a piece of good quality tissue paper over this hole, which may be ever so irregular, the tissue being of the parchmentized paper kind, so as to withstand wetting. The

cardboard may now be held upon the printing frame with four or six small tacks.

The negative is now placed in the frame once more. Both are then held up to a source of light, and stumping with opaque is carried out with a stubby bristle brush upon the tissue paper and its cardboard support, the exact amount of shading being brought about by this stumping, when the negative and frame are turned over, and all the other portion around the stumping is filled in with opaque.

This method of vignetting is carried out in about the same time that it takes to describe it, and may be used for any size or kind of vignette.

There is quite a knack to be acquired in fitting negatives this way, but when once it is gained the plan will be adhered to, because it is suited to every kind of picture and easily applied, and costs next to nothing for its production.

A film portrait to be vignetted must be attached to a clean glass plate, at the corners, by means of strips of gummed paper, the same operation being then gone through as for glass negatives.

Many times a vignette may be made from a small head upon a 5x7 negative by simply placing the negative upon another 5x7 piece of clean glass plate, holding the two together with gummed paper strips, then placing a piece of tissue paper over the part desired upon the glass plate and stumping in upon the tissue paper. The thickness of the glass plate, combined with the thickness of the glass negative, gives the requisite distance for dispersion of the light, producing just the effect required in a small vignette.

A Sensitizer for Greens

The reproduction of green by orthochromatic methods is not as successful as the tonal value reproduction of other spectrum colors.

Indeed, by judicious manipulation of the ordinary plate it is possible to get better rendition than even with a panchromatic plate.

Up to the present there has been no practically satisfactory sensitizer for the green rays.

Auracin G and Acridin orange are the only two dyes which give approximate valuation, but even these occasion disturbance by their retention. It is necessary to have recourse to numerous washings with alcohol to remove stain.

A discovery is reported in Germany by E. Koenig, of a new basic yellow by Dr. Schuloff, which sensitizes to the D line in the yellow band with maximum at E.

It seems, however, to lower considerably the degree of sensitiveness of the plate. Its chief use seems to be for application in three-color work, as it permits the use of yellow instead of the green filters.

We are in receipt of the new catalog of the Wollensak Optical Co., Rochester, N. Y.

It is a very attractive pamphlet, profusely illustrated with photographs which exhibit the marvelous qualities of their lenses and demonstrate the high efficiency of the well-known and everywhere-appreciated shutters Besides this, the pamphlet has information relative to the use of the appliances of photography of particular interest to its worker in determining upon the character of the lens, size of shutter, etc., to be used.

The catalog is very elucidating in these particulars and it is advisable that the photographer should avail himself of the advantages here presented.

Catalog mailed on application to Wollensak Optical Co., Rochester, N. Y.

We have received from Willis and Clements, Philadelphia, a photograph made upon their new paper, "Satista." The photograph is portraiture of high artistic merit, in a beautiful rich, warm black tone. The paper is especially adaptable to portraiture. It gives the high-lights soft and modulated and the deep shadows, rich and luminous with a wealth of gradation between. It seems to be a most adequate medium of translation of the qualities of good negatives, which is a great desideratum in printing. In most printing methods there is more or less loss in the transcription to the positive picture.—The paper is less costly than platinum, and in our opinion is its equal; and its merits should be appreciated by photographers who desire a change from bromide and gaslight papers. It is a paper for the artistic photographer. The paper prints rapidly and gives even a better deposit than the black satista. The effect is particularly good on cream stock matt surface paper.

Willis and Clements will gladly mail a portrait print to photographers desiring it or make a free sample print if a negative for the purpose is sent them.

The Photographic Journal of America

July 1922

PRICE 20 CENTS

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PHILADELPHIA

The new film that saves the picture

The greatest photographic achievement in a generation

"CORRECT exposure is the secret of success." From the earliest days this has been an axiom of photographic practice—and a stumbling-block on the road to perfect pictures. Records of finishers show that more than two-thirds of the failures in amateur photography are due to faulty exposure.

The need for a new film

With film sales mounting into millions of rolls a year, the difficulty of teaching users to expose correctly has grown increasingly great. Plainly, it seemed to us, some other alternative must eventually be found.

With this necessity before them, Ansco chemists have labored for years to produce an error-proof film which would automatically compensate for mistakes in exposure, an attempt which was ridiculed by many as foredoomed to failure.

A dream come true

The "impossible" has at last been realized in the new Ansco Film, the greatest achievement in the photographic industry in a generation.

This new film is the fastest on the market, yet no film fast or slow stands up so firmly despite excessive overtiming. Where other film goes flat, Ansco Film merely builds up in density without disturbance of the tone relations.

Beach and water scenes, and blue skies with white clouds, hold their delicate contrasts without breaking down. The most astonishing variation in exposure yields a remarkable uniformity in balance, so that even a change in the grade of paper is seldom required. Combined with these qualities is a well-nigh perfect scale, assuring registry of all the half-tints and intermediate tones, in addition to orthochromatic values unequalled in other film. And the fineness of the emulsion makes the film ideal for enlargements of extra size.

The new Ansco Film is spooled with a new orange paper to facilitate reading the numbers, and responds superbly to the finisher's methods. Finishers find this new film more profitable, because of the higher yield of deliverable prints and the saving in time made possible by sticking more closely to the same grade of paper.

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CHASING BUTTERFLIES WITH A CAMERA —L. W. BROWNELL

TO ANY of my readers who owns a photographic outfit, even though it be nothing more than a Kodak, and who has tired of wasting film on snapping friends, singly or in groups, with an occasional landscape or architectural picture interspersed, I would recommend that they try their hand at photographing our butterflies. Let them not think that this is a pursuit entirely devoid of all the elements of sport, for especially to those who are fond of outdoor life, and I think there are few of us who are not, there is much of sport as well as excitement in hunting butterflies with a camera.

The hunting of butterflies is by no means a novel occupation and he who has followed larger game, with rifle or shotgun, need not imagine that in this chase of a smaller quarry there is no excitement. To be sure the game sought can offer no serious resistance to its capture, other than flight, but to follow a coveted specimen wherever it may lead and with the care necessary not to frighten it until it alights upon some flower; to creep toward it, until within striking distance, only to see it dart suddenly away; to follow again through brambles, thickets, fields and woods until it is either safely bagged or has definitely escaped, requires a quick eye, a steady hand and a considerable amount of ingenuity, nor is it without its full quota of excitement. When we exchange the collecting net for a reflex camera or Kodak, we will find that we must be even more careful in our approach of an intended "victim," for we must be even nearer him when we make the exposure than would be necessary if we were to sweep him with a net. In a like proportion the sport and excitement is intensified. Frequently, after I have made an exposure and feel confident that I have, on my photographic plate, the image of the butterfly I have been chasing, my satisfaction and elation is certainly as great as is that of he

who sees the flying grouse or woodcock fall at the report of his gun, and I have the added satisfaction of knowing that I have taken no life.

There are, of course, many difficulties to be overcome in this pursuit, but to the active man, these difficulties should be only added incentives to persevere until success is reached, rather than reasons for giving up the chase. It is strange to me that, in a field which is so full of chances to obtain interesting and really valuable material, there should be so few workers. While our books on mammal and bird life are now profusely illustrated with excellent photographs, those on insects continue to use drawings or, at the best, photographs from dead specimens. We seldom see more than an occasional photograph of some of the larger moths or butterflies, and yet there is no reason why photographs of insect life should not be just as plentiful and as good as those of any other branch of Natural Science.

It must be remembered, however, that to be of any real value, these photographs must be taken from perfect specimens, with the wings undamaged, and that the image on the plate must be as large as possible. Also the image must be absolutely sharp and show no motion, in order that the markings may stand out with perfect distinctness. The background will, of necessity, be out of focus, but this will make no particular difference, so long as we are careful not to have any leaves, flowers or other objects in the immediate background that will tend to obscure the outline of the butterfly and so give the entire picture the appearance of being out of focus. Of course it is not always possible to pick and choose the position which your subject assumes, but when it is possible to have the background some distance away, so as to show with the least

"MOURNING CLOAK BUTTERFLY—VANESSA ANTIOPE"
L. W. BROWNELL

MARSHAL FOCH ORREN JACK TURNER

GOV. EDWARD I. EDWARDS — ORREN JACK TURNER

distinctness, the butterfly will, naturally, stand out to much better advantage. The sky as a background is much better still and in many instances, with careful manipulation, this can be accomplished.

With this advice in mind, take your camera some fine morning, when the sun is shining brightly and see what you can accomplish as a butterfly hunter. If you have a Graflex, or other camera of the reflex type, that is the outfit pre-eminently useful in this work. If not, then take your tripod outfit or even your Kodak, but if the latter, be certain to have a portrait attachment on the lens or else you will be unable to obtain an image on your film large enough to be of any value.

The spot from which you will obtain the greatest returns is a piece of meadow or marshy ground that is fairly well grown up to tall flowers, such as joe pye-weed, asters, goldenrod, thistles, thoroughwort, sunflowers, etc. In such a field you will be apt to find the butterflies plentiful, and with a little luck and some ingenuity, you should be able to obtain a number of very excellent "shots."

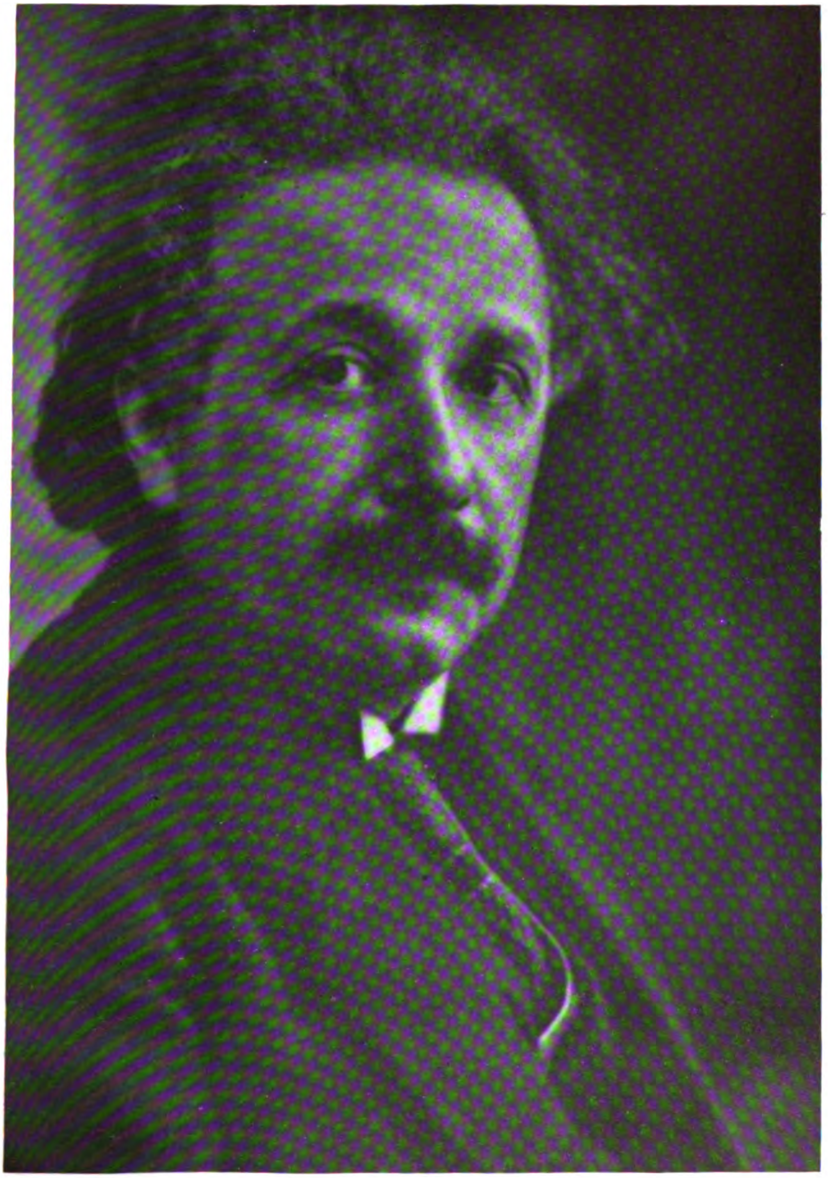
If you are hunting with a Graflex or Kodak, you can stalk your game and this, perhaps, is the most successful method of butterfly hunting. The one thing to remember is that you must approach your subject with the greatest

"THE YELLOW SWALLOWTAIL—PAPILIO TURNUS"
L. W. BROWNELL

caution. A butterfly will almost always remain on the flower head, leaf, branch, or whatever other perch he may have alighted upon, and allow one to approach to within a foot or so before leaving, if the approach is made very slowly and without any unnecessary movements. In fact, one may frequently pick a butterfly from its perch with his fingers, if his movements are all slow and careful. The next important thing to remember is that it is not well to snap every chance that presents itself, without due consideration as to whether or not the resulting picture will be good. In a field, such as I have described, you will have plenty of chances during a day's, or even half a day's hunting, and so it is well to make exposures only upon such subjects as are well posed, in a good light and with a proper background. If you do so, you will find that you will have fewer plates to discard when you come to develop them. Another point, never make your exposure until the butterfly's wings have ceased to move, for with the fastest exposure you could possibly give to secure a well-timed negative, you would be unable to stop the movement in a butterfly's fluttering wings and the result would be a negative so blurred as to be utterly worthless.

The earliest butterflies to appear in the spring are the Mourning Cloaks (Vanessa) and the Angle-wings (Grapta). The former of these may be found flitting about some sheltered spot in the woods on the very first warm day of March or early April. They may all be found, however, throughout the entire summer and fall as they, like the common Milkweed butterfly, are several brooded. They must be looked for in the open woods and orchards. The latter place is particularly attractive to them in the fall, especially the angle-wings, who feast upon the juices of the rotting fruit. At such a time, it is easy to obtain their photographs, for they will frequently suck the fruit juice until they are almost unable to fly and once having sucked their fill, they will fly to some perch on a nearby branch or trunk, from which place they are not easily frightened away by our approach, provided we do not rush up with too great a commotion.

If you are using a tripod, then you must use slightly different methods Upon entering your field of operations, select a flower, or group of flowers that is conspicuous and stands well above its fellows. If it is high enough to allow you to use the sky as a background, so much the better. If not, then all herbage in the immediate background, that would obtrude in the picture, must be cut away for some distance back to allow you, as I have before explained, to obtain a clearcut image of your subject. Now set up your camera, focus sharply upon your flower head, insert your plate holder, set your shutter, draw your slide and cover your camera well with your focusing cloth to prevent fogging of your plate. All that now remains for you to do is to wait with what patience you may the arrival of your first sitter. You are not apt to have a very long wait, but to make that wait as short as possible, you must remain as nearly motionless as is possible for a movement upon your part will frequently frighten away an approaching butterfly. Again let me warn you not to be in too great a haste to make your exposures, but wait until your sitter is still and in a favorable position. You will have many opportunities and even if you do not, it is much better to go home with one or two good exposures than with ten or a



DR. ALBERT EINSTEIN ORREN JACK TURNER

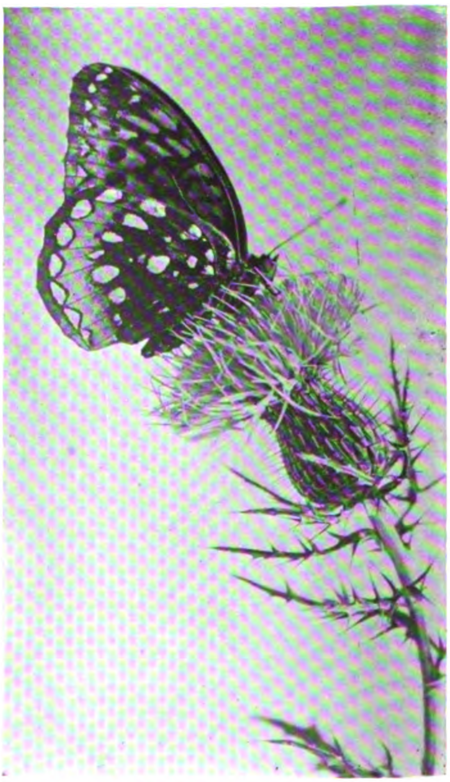
WILL IRWIN ORREN JACK TURNER

dozen bad ones. If you wish, you may hang a piece of white cloth back of your flower head to shut out all the disturbing background but, in case you do so, be sure to have it far enough back not to show what it is, and also, the nearer it is to the flower, the more apt it is to keep butterflies away. Altogether, I think it much better to select a flower from which the background can be cleared sufficiently to make it stand out by itself. This has always been my method and I have never found it necessary to use the cloth.

As to the size to make the image, that is, of course, largely a matter of one's taste and opinion. I am inclined to the belief that the larger the image the better up to life-size, as allowing the markings to show to much better advantage. Of course, if you are using the Kodak, it is impossible to obtain a life-size image and then you must accept what you can get. But with a tripod or reflex camera, it is not only possible, but easy and I would always advise it. Another point, if you are using plates, by all means let them be the orthochromatic, for you will find that you need them in order to reproduce with any accuracy the reds and yellows, which are the predominating colors in many of our butterflies. If you are using cut films, they have the orthochromatic quality and are, really, much to be preferred to plates.

"THE VICEROY BUTTERFLY—BASILARCHIA DISSIPPUS"—MALE AND FEMALE. L. W. BROWNELL

It is probable that the finest photographs of butterflies, at least from an entomological standpoint, are those made indoors from newly hatched specimens, but this does not carry with it the pleasure of being out of doors nor the sport and excitement of hunting your subjects. As some of my readers may care more for this method than for the other, I will say a few words concerning it. First, you must collect your chrysalids or, what is really easier, raise them from the larvae. After these hatch, there is a period when the butterflies' wings are fully expanded and perfect, so far as can be told by looking at them, but still so damp and weak as to be useless as means of flight. This period lasts for several hours and during it you can do as you choose with your subject, provided you always handle him with circumspection and care not to injure his extremely delicate wings. He is, of course, at this time a perfect specimen and, as such, will make a perfect photograph. The photographing should be done by a window, one facing the north is preferable. Pose your subject upon flower, leaf or branch or in any manner that you prefer and once having placed him there, you may be sure that he will remain perfectly still for some time, long enough, at any rate, for you to focus upon him leisurely and make an exposure



"THE GREAT SPANGLED FRATILLARY—ARGYNNIS CYBELE"
L. W. BROWNELL

of the necessary length of time to insure a perfect negative. You may even "stop down" your lens to insure having everything in sharp focus and give an exposure of a minute or more with absolute safety. I would advise the use of a white background, and a white reflector, on the side opposite the window, is necessary to insure evenness of illumination.

There is much that can be said for each one of these methods, but the former is the one that carries the greatest appeal to me as being the one that keeps me most in the open, and I think that most of my readers will agree with me. However, the two methods may be successfully combined and a most beautiful and valuable collection of photographs will be the result.

DISTURBING LENS REFLECTIONS—DR. J. RHEDEN

WITH the head under the focusing cloth, examining an image on the ground-glass, we are attracted and become conscious only of those light rays which operate towards the production of the picture. Or in other words, of those rays which penetrate the lens, enter it, break according to the curvatures and indices of the glasses, and reach the plate with slight variations of direction without being subject to any decided change of course. Passing through the lens, the light suffers not only from diversions (obeying the laws of refraction), but also from the vagaries of retroactive rays (obeying the laws of reflection). The retroactive rays pursue another path than the broken ones and consequently strike the image forming area, if at all, on other parts than the light rays proper. Whenever the intensity of reflected light becomes stronger than the developing capacity of the plate, the image thereupon becomes cloudy and blurred.

No doubt, it is within the experience of every photographer, to have been surprised at one time or another by noticing on some negative disturbing reflections, either in streaks, fog spots, shapeless halations, circles or halos, the existence of which he is at a loss to understand or explain.

The purpose of this study is to offer to the unscientific mind some valuable information as to these "inexplicable" aberrations of light. The author realized that a mere knowledge of the causes of disturbing light reflections, although of interest, are of no particular practical value to the photographer in trouble. And so he has set forth to make a fairly exhaustive record of these phenomena —by the means of photographic reproduction—which will help photographers to become more familiar with the character of lenses (not of any special make, but those they have in their studios), to enable them in plain words to find out "what is the matter with them," to diagnose the disturbing elements and to remedy these shortcomings if possible.

Let us start our investigation with a consideration of the "flare spot" known to all operators, and I must not forget to add also to all amateurs who have worked out of doors with the ordinary landscape lens. The flare spot is

due to reflections produced on the edges of the stop-opening. No matter what the light condition and the shape of the aperture may be, it appears as a considerably enlarged, blurred and round spot. Up to date lensmakers have overcome this disturbance by making the flare spot cover more than the whole of the plate, on the principle that "when a reflected light is extended over a large area, it becomes so attenuated in intensity that it is practically absent."

But the flare spot of older lenses is very appreciable and bothersome when concentrated as a big blur. To make the aperture smaller is of no avail. True enough, the spot becomes smaller but at the same time it increases in distinctness and brightness.

This teaches us two lessons. That, the smaller a reflection is, the brighter it generally appears (as smaller openings necessitate longer exposure). And that reflections are always produced along the line where two mediums of different optical density meet.

For that reason the retroaction of rays is strongest on the parts of the lens exposed to the air. In passing from one sort of glass into another, as in a double lens, this action is reduced to a minimum, provided that the combination is well cemented and thereby subject to "optical contact." It is equally easy to understand that the more free planes a lens possesses, the more opportunities it will offer to an invasion of reflections. Some of these reflections will never pass into the interior of the camera, but will rebound backwards and disperse. Also this is due to laws, but of no particular concern to us.

Reflections, on the rule, are of greater dangei to the image when they are small rather than large, (as we have occasion to mention above, a complication of reflections is generally less injurious—as it lacks brightness—than a single direct reflection.

The rays of reflections form cones just like the rays of light of the object that is photographed, and the blurred images of reflections are in the same way caused by the interruption of the plate, which impartially records any cone-like distribution of light. The nearer to the plate the point of such a cone is situated, the brighter the disturbing reflection will be (for the light capacity of reflection grows in *quadratic* fashion with the approach of the cone-point).

Besides these reflections which originate on the lens surface, there are others which are called to life by defects along the rim of the lens or the air-exposed edge of the barrel. Caused by insufficient blackening in cementing of the rim of the lens, or by shiny spots on the inner edge of the casing, these reflections are strictly accidental, and as they are generally exceedingly bright, and large, they easily become detrimental to good picture making.

There is such a variety in the size, shape (although mostly circular) light intensity and combination of reflections, that I attempted a classification of the same.

The peculiar part of these reflections is that they are *not noticeable* to the naked eye on the ground-glass. The light of the image making rays is mostly so strong that they swallow up all the minor lights. Besides the ground-glass itself allows a great deal of light to pass through it unnoticed, using only a

fair percentage to form the image. The simplest way to study reflections is to place the camera, wide open, in such a way as if you were "shooting directly against sunlight," of course avoiding the sun itself, which can easily be done by covering it, for instance, by the woodwork around the upper part of a window or door. You will then see either flare formations or smaller and larger circles with bright contours quite plainly. Each lens will tell its peculiar story, as shown in the accompanying diagrams. But gazing at the sun is not a pleasant occupation. The human eye is too sensitive and too easily irritated to indulge in prolonged studies of this kind. The photographic plate will be more reliable, I argued and so I came to make a fairly exhaustive record, following out one of my own devices.

I used an arc light of 10 ampere strength as a direct source of light, about six yards away from the camera, arranged in such a way by extensive screening that only the light of the arc reached the lens. (Of course, exposure at night in an otherwise dark room gave the best results.) Immediately before the plate I placed a frame crossed by two wires meeting in strictly rectangular "crosslike" fashion (viz. diagram). At the point of intersection I soldered on a little metal disk of about ¾ of an inch diameter, and coated the same and wires with lamp black. Now happened what I expected, the light of the arc, when accurately focused on the black disk, was entirely absorbed by the same, and just admitted a sufficient amount of light to produce a darker middle tint on the plate. The reflections were sharply recorded, with an exposure of four seconds and the lens wide open (the latter to record also the "rim and edge" reflections).

In this way, after examining a large quantity of lenses, I was able to classify the disturbances into three groups.

Group A.—Very bright reflections which travel in the same relation and at the same angles as the image forming rays, crowding around them in larger and smaller circles, and at times also producing regular halos as in diagrams 8 and 14.

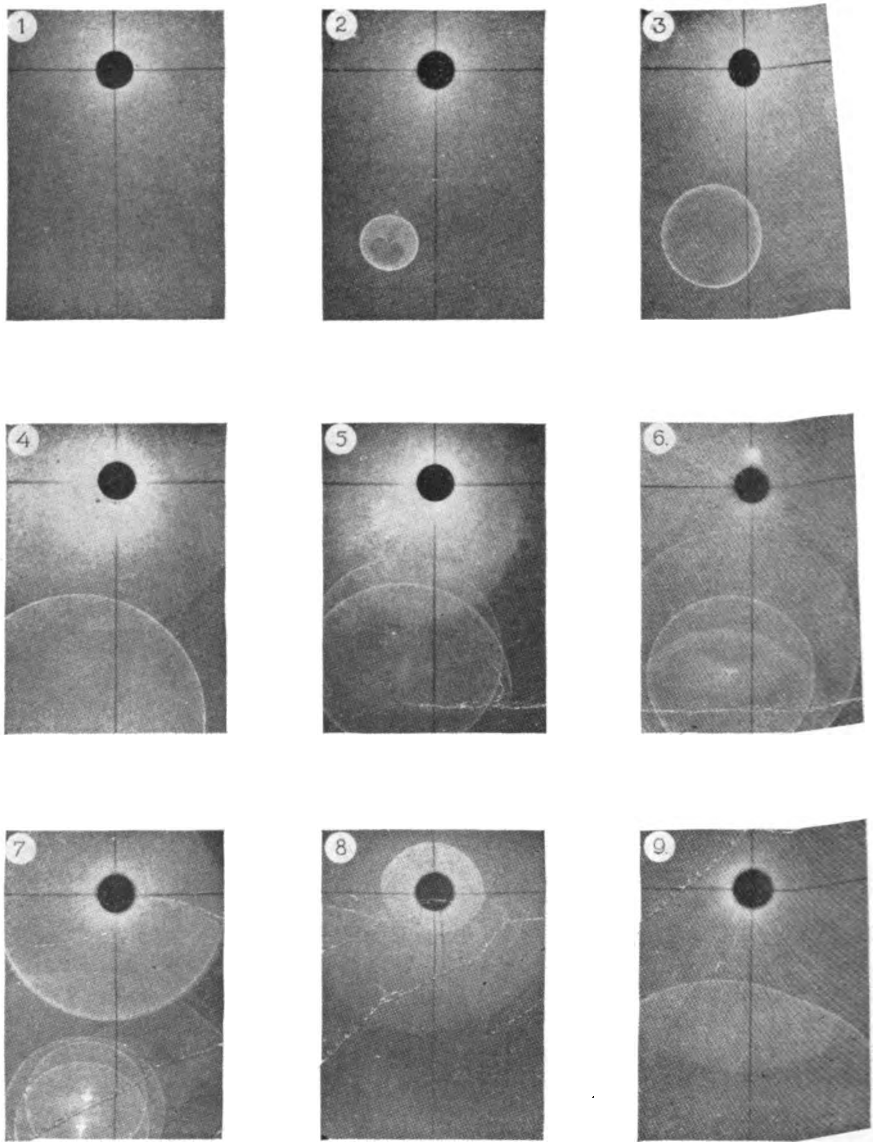
Group B.—Reflections which withdraw or diverge from the center of the lens in the same relation as the rays from the real light source, only that they disperse at wider angles, attacking the marginal parts of the picture as their special field of operation. The largest part of these circles (as seen in diagrams 4 and 9, for instance), falls outside the picture area, but enough remains to cause flatness in the shadow parts.

Group C.—Reflections which move in an opposite, contradictory sense than the light rays proper, which are exceedingly varied and numerous (viz., diagram 7), and particularly injurious as they strike the image forming area in the lower darker parts.

(Reflections from the interior walls of the camera are not taken into consideration, as they rarely occur in a good apparatus.)

Let us now examine the diagrams separately and see what object lesson they contain for us.

Diagram 1 is an exposure with a Zeiss Protar lens and shows the excep-



tional merit of an absolute absence of reflections, only a slight shimmer around the black disk caused by minor impurities in or upon the lens, which are as harmless as they are unavoidable. Particularly fortunate curvature of the front surface of the lens is the cause of it. The old Steinheil lens generally showed this freedom from reflections of any sort. It is conducive to particular clearness in the negative.

Diagram 2 is an exposure with a Zeiss Double Protar lens, and shows a small matty circle with a shape that resembles the spade of playing cards The

reflection belongs to group C. It might produce a slight hardly perceptible blur in the negative.

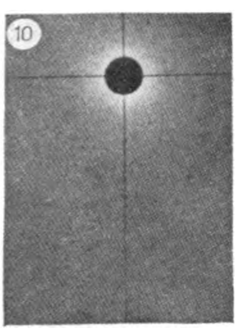
The circle in diagram 3 is a trifle larger and less luminous. It was taken with an Icar-Maximar (double anastigmat type) and belongs to group A.

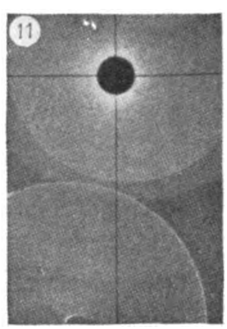
Illustration 4 is the product of a Zeiss Tessar *f*4, 5, 120 mm. We notice an extensive but pale reflection of group C, and a weak half circle of group A.

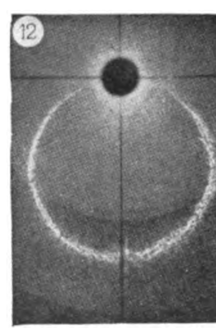
Diagram 5 is a good example of a four part anastigmat lens—a Meyer aristostigmat *f*5, 5, 150 mm. The reflections belong to group C and are weak excepting the halation around the disk. None of them are apt to do much damage.

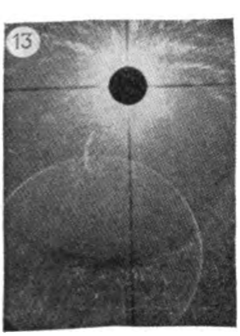
Of a by far more dangerous nature are the accumulation of reflections in diagram 6. They are even throughout and may throw a haze over the negative if sufficiently strong. They are due to contrary reaction. The little very bright spot, a product of group B, may produce a spot. It was taken by an older Zeiss. The radiating streaks around the disk come directly from the lens, no doubt from some minute remnant of fat, which was on the rag with which the lens was wiped.

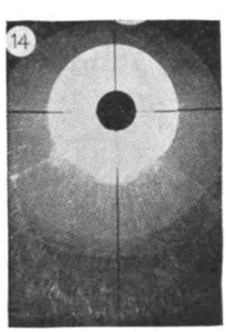
Figure 7 shows a most unfortunate accumulation of reflections of group C, a large and particularly bright one of group A, and furthermore the rare occurrence that the points of two light cones fall almost directly on the picture area. This is sure to cause some trouble, specially so if the foreground in the picture is very dark











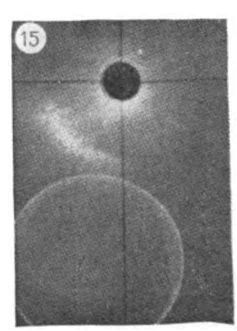


Diagram 8 was taken with a Voigtlaender triple anastigmat. It shows no reflection of group C, but one very weak one and one very strong one of the halo order of group A. For that reason the lens is little suited for strongly lighted exposures in interiors, but almost an ideal instrument for landscape work.

Diagrams 9 and 10 and also 11 form a special group. 9 shows similar reflections as 4 and was taken under similar conditions by a Tessar f4.5, 150 mm. Adding a Distar (viz., diagram 10) to my great surprise, suddenly all reflections disappeared and the negative became as free of disturbances as our first diagram. On the other hand, when I placed the same Distar at the back of the Tessar, the old shortcomings reappeared with the addition of several other minor disturbances as shown in diagram 11.

The four last pictures, diagrams 12-15, furnish examples of "rim and edge" reflections, which should offer a very wholesome piece of advice to photographers to keep their lenses clean and their lens barrels in good condition. Diagram 12 is really a modern version of the "flare spot." It was caused by an insufficient blackening of the rim of the front lens and some defect in the casing. Defects of this sort should really not occur in lenses of reliable make, at least not for many years, still they do occur. Diagram 13 looks more like a picture of a solar disturbance than one caused by something as simple as the peeling off of some of the opaque protective color. Both, 12 and 13, are almost free from other contaminations. While diagram 14 is the illustration of a very extreme case, a combination of imperfections.

There are several reflections of group A, so exceedingly bright that they make the lens useless for interior exposures. A small part of a bright reflection of the group B is also visible on the upper margin. Besides, there is an aureole of light streaks, so large that it covers almost an entire half of the plate, which is solely due to a scratch or scrape on the metal edge of the lens barrel The same can be said of diagram 15, which shows the blurred section of a circle due to the same cause. The radiation around the disk comes from a dirty finger mark, which cuts off or obscures at least one half of the light that passes through it. The almost perfect circle that appears in the lower part as a luminous outline is caused by some weak and stray reflection which is harmless as it possesses no light intensity whatsoever.

With this ends our investigation. My study embraced many more examples, but there is no use for repetition, as I made a special effort to show an *average* of such reflections as are apt to occur most frequently, and to display them in as comprehensive, if slightly exaggerated, a manner as possible. My selection of an extremely strong light source made the shortcomings over conspicuous. They will alter with every illumination, and in ordinary lightings with normal openings cause but little trouble. Still, they may prove fatal at any time, and most unexpectedly so. If the light source is above or behind the camera, reflections will be weaker and less frequent. Also direct sidelight will not particularly interfere. But as soon as the light begins to strike the lens diagonally or directly from the front, disturbances may be anticipated. My

records are given only as suggestive, and must not be considered by any means as a complete solution of the problem. But every bit of knowledge should prove helpful. Many an important exposure has been spoiled by accident and it is just as well to know all one can about such an evasive and intricate subject.

Still, I know photographers well enough, that although lenses represent a great expense, they will not go to the trouble of testing their lenses the way I have put forth. And perhaps this is not necessary as for ordinary purposes one can trace the nuisance of possible reflections in a much simpler manner.

It is simply this. Take a subject, light and arrange it as perfectly as you know how, as if you were bent on making a masterpiece, and then when you examine the composition on the ground-glass, forget all about pictorial elements, and simply scrutinize the image whether it is perfectly clear in the foreground, and shows no haze whatsoever. If you are in doubt about it, apply lens hood, safety cap or any other device and shade the upper part of the lens. If the *foreground* gains thereby in depth and clearness, you may rest assured that some reflections are active and ready to assert themselves. Unless you can remove the causes of these reflections you are obliged to depend on shading and screening. Make a habit of this, for the reflections do not necessarily appear as definite shapes but merely scatter and obscure the action of light (almost imperceptibly at times) on the plate.

You wonder why the negative is not perfectly clear, and you accuse yourself that you made a mistake in your calculations, while the real fault was some weak reflection, which you could not notice with the naked eye, but which did damage all the same.—*Photographische Rundschau.*

RECOVERY OF SILVER FROM FIXING BATHS

BRIEF allusion was made to this topic a few months ago in THE PHOTOGRAPHIC JOURNAL OF AMERICA, especially with reference to the newly introduced precipitant, sodium hydrosulphite, which throws down the silver in metallic form, and is said to leave the bath in condition for further use. In fact, one writer claims that the bath can be twice revived. The renewal of the bath itself is not so important as the recovery of the silver in a form suitable for prompt use. The main objection to the commonly used method, precipitation with sodium sulphide, is the trouble of dealing with the sludge of silver sulphide. The problem is discussed at considerable length by J. Burian in *Das Atelier.*

Many methods have been proposed. Among others the introduction into the bath of zinc, copper sheets or even brass. By these methods the silver is separated in the metallic state, but the precipitating materials are somewhat expensive, and it is not always easy to separate the remainder of them from the mass of free silver, and any such contamination will be very objectionable. Moreover, rather large tanks are required for the operation and the process

is slow. In plants in which large amounts of the solution are regularly treated, automatic arrangements for the operation may be installed.

The procedure with sodium sulphide is easily carried out. The solution of the precipitant has an odor offensive to most persons, but ventilating attachments can be easily designed to reduce this to a minimum. The disposal of the desilvered liquid will be often a serious sanitary problem, and the treatment of the silver sulphide sludge is also not entirely simple. The material is usually sold to dealers on assay, and must, therefore, be removed from the tanks and dried as far as possible.

Burian has taken up the question with a view of improving the procedure, and gives the following description, by which the silver sulphide is obtained in compact masses. The precipitating tank is really a filter-vat with vertical sides. The contents of the fixing bath are transferred to large ladle, holding about two gallons, the proper amount of sulphide solution is added and the mixture introduced promptly into the filter. The process goes on without delay. The sulphide falls down on the filtering cloth, while the liquid runs through. The precipitate, of course, forms a layer which steadily thickens as more material is introduced. On account of the weight of the particles of the precipitate, very little adheres to the sides of the vessel. (It seems to be still more efficient to construct the filter tank in the form of the well-known laboratory precipitating jar, that is, with sides inclining so that the bottom is wider than the top.) The construction, however, of the filter is said to be quite easy. The capacity should be such that the entire volume of the fixing bath used in the establishment can be treated at one operation. The filter is made of some suitable textile, moderately porous, and is fastened snugly over a metal or wooden frame. The frame should be well coated with some good varnish that will resist the action of the chemicals. The form of the frame is that of a basket of open work, about as high as the tank, and having as a base a number of cross pieces forming a grid, so as to support the weight of the precipitate. Before beginning the operation, the filtering material should be thoroughly wetted.

The solution of sodium sulphide is made very strong; the dissolving may be hastened by using hot water, and the liquid is preferably filtered prior to use, as the commercial article contains impurities which are precipitated on dissolving. It is important that the amount of sulphide used should bear a close relation to the amount of silver to be precipitated. Tests may be made by taking small portions of the hypo solution and adding known amounts of the sulphide (that is, using known volumes of a solution of definite strength) and noting what amount is required to produce a liquid from which no further precipitate is produced on further additions of the precipitating liquid.

The procedure will be easily carried out. At the beginning of the operation, some of the precipitate may pass through the larger pores of the filtering cloth, but this will soon cease. If the filter is laid aside for some time, it is advisable to rinse well with water before using, and a similar rinsing is advisable, if the filter has been in somewhat prolonged use. After a considerable

amount of precipitate has been collected, it is allowed to rest for some hours, or over night, when the mass will become fairly dry and can be turned out easily from its place. It can be dried in the usual way and passed over to the refiner.

The procedure is applicable only to the regular fixing bath. As is well-known, the other solutions, such as waste developer and washings, contain no appreciable amount of silver, but the wash-water from printing-out paper may contain enough silver to make it worth while to recover it. This procedure is applicable to such liquids. The operation must be carried out in a well-ventilated place apart from the general operating rooms, as the solution of sulphide emits hydrogen sulphide which is disagreeable and injurious.

The above process takes no account of the use of the hydrosulphite, which is without the objectionable odor of the sulphide, and which yields metallic silver. This method, however, is not satisfactory with the acid baths, whether made with chrome or common alum. In a recent description of the method, it is recommended to add considerable sodium carbonate, and it seems that this addition might be objectionable if the bath is to be used again. In fact, under ordinary conditions, hypo is so cheap that a second use of the bath is scarcely advisable, but the recovery of silver from the bath is a matter of great importance on the large scale, especially in motion picture work.

The subject is also discussed in a recent issue of the *Photographische Rundschau*, by H. Lenz. He refers to the use of zinc dust. He states that a dozen 3½ x 5 plates contain in all 1 gram (15.4 grains) of silver. Of course part of this remains in the finished plate, but a large amount passes into the fixing solution. The procedures described by Lenz are, however, not convenient, and it is likely that the hydrosulphite will displace all other precipitating agents. The reaction is the conversion of the double salt, silver sodium thiosulphate, which is freely soluble in water, into metallic silver and sodium thiosulphate, the latter being the substance commonly known as hypo. Sulphurous acid is also produced by this remains dissolved in water. In the description given in the journals, sodium carbonate is added with the hydrosulphite and this takes care of the sulphurous acid, converting it into sodium sulphite.

WHERE ART IS OUT OF PLACE

WE have seen group-pictures composed with respect for the rules of art, which presented a stiff and unnatural appearance.

Each separate figure of the group may have been posed with the greatest degree of care and the whole arrangement studied for the best effect, yet the whole picture looks hollow and unreal.

This suggests that there is some perversity attending the composition of groups by photography. Why is all expenditure of skill and taste abortive without even giving the compensation in the lesson it might furnish for future improvement?

We discover by application to the painter that the failure may be attributed to neglect of the precepts constantly kept in mind by the painter in the making of groups.

The whole field of group-work falls practically into two classes: first, the essentially artistic, and, second, that which from its character is not susceptible of pictorial rendition, no matter how much artistic effort may be expended upon it. Now this looks like utterance of a paradox, to say that any pictorial presentation is not amenable to artistic manipulation, and that a picture is better for not having indication of artistic treatment.

Take, for example, a case where there are numerous individuals in a group to form a picture or let us call it "an agreeable association," the conditions imposed being such as are usually inflicted upon the photographer, to wit, that each individual should be a portrait, yet no one of the group to have prominence over the rest.

Would not the best painter be handicapped by such an imposition?

Yet the art photographer imagines he can accomplish such a feat. It is a problem he meets with and he believes he has well delivered himself of the commission because he has placed the units in certain line and mass distribution.

If the artist does undertake such a work, he demands an extensive range of foreground and background, a natural setting to the group which interprets its *raison d'être*. Stothard, the painter, gives some excellent large groupings, but action is always expressed and the surroundings are in accord with the motive. But the photographer is restricted in foreground and limited by a very shallow distance and yet he tries for a picture, and, at the same time, tries to do justice to all, with the result that, instead of a pleasing composition, he has to contend with a number of refractory verticals and horizontals.

Photographically viewed, it is salutary to eschew art where an interior group is contemplated composed of more than a half dozen individuals. On rare occasion, to be sure, a few more might be included, but the artist is on danger's edge, particularly if the motive is indicative of repose.

By the condition of things any large group is inadmissible and failure is courted or rather assured if the attempt be made. Try for as well disposed formation as possible with the crowd. You can give satisfactory portraiture of each one, but never a picture of the assemblage and do not attempt it. So much for groups where art is "more honored in the breach than in the observance," but remember that there are groups than which nothing can be made more beautiful wherein the artist may exploit his faculties—if he observes decorum—groups that are genuine art by photography. But even here the photographer must be on his guard not to attempt too much by going too far. Hs must do honest work and yet make it pleasing, and it can be pleasing only when it is sane work and does not betray the supreme effort made to advertise that its only purpose is to exhibit the artistic bent of its maker. Real pictorial groups are not concerned primarily with portraiture, *per se*, but belong to that category of work, inspired by "art for art's sake;" where ordinary conditions may be slighted for higher considerations.

(CONTINUED)

Materia Photographica

A Dictionary of the Chemicals and Raw Materials of Photography.

Part I—General Materials.
Part II—Dyes and Developing Agents.

BY

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ACID GALLIC, $C_6H_2(OH)_3CO_2H.H_2O$ 3:4:5

Fr. Acide Gallique; Ger. Gallussäure

Syn. Acid Trioxybenzoic, Acid Trihydroxybenzoic.

M. W. 188.06: Sp.G. 1.694: M. P. 220° to 240°C.

Sol. in alcohol; Ss in water and ether.

P. Slightly yellow or colorless crystalline needles or prisms.

Der. Obtained by fermentation from powdered galls or by boiling tannin with dilute acid or caustic soda.

G. U. S. P.

A. P. $1.12 per pound.

U. P. Not very much used in modern photography. In the early days of photography, was used as a developer for paper negatives. At the present time is occasionally used in the development of P. O. P., intensification of collodion and gelatine negatives, and as one of the ingredients in the ferrous citrate developer for chloride plates. Is used by lithographers for preparing the surface of zinc plates for printing.

ACID HYDROBROMIC, HBr in Aqueous Solution

Fr. Acide Bromhydrique; Ger. Bromwasserstoffsaure

Syn. Hydrogen bromide, Bromhydric acid.

M. W. 81: Sp.G. 1.38.

Sol. in water.

P. Faintly yellow or clear colorless liquid.

Der. Made by passing hydrogen with bromine vapor over a warm platinum sponge which acts as a catalyzer and then collecting by absorption in water.

G. U. S. P. (40% HBr.)

A. P. 85 cents per pound.

U. P. Used in the production in some of the bromides used in photography. Sometimes added to emulsions as a preservative. Small additions of hydrobromic acid will cure fog in an emulsion, at the same time decreasing the emulsion speed.

ACID HYDROCHLORIC, HCl

Fr. Acide Chlorydrique; Ger. Chlorwasserstoffsäure

Syn. Muriatic acid, Hydrogen chloride.

M. W. 36.5: Sp.G. 1.16:

Sol. In water, miscible in all proportions with alcohol and water.

P. Clear, colorless or slightly yellow. Fuming pungent liquid, poisonous.

Der. Usually made by the action of sulphuric acid on common salt. Also as a by-product of the LeBlanc soda process.

G. U. S. P. (33% HCl).

A. P. 53 cents per pound.

U. P. Generally used as a clearing bath for pyro stains and as a clearing bath in

the platinotype process. Is used in connection with vanadium, iron and the copper toning processes.

The addition of HCl to chloride emulsions increases speed, also tends to make such emulsions clean working and free from fog.

ACID HYDROFLUORIC, HF

Fr. Acide Fluorhydrique; Ger. Fluorwasserstoffsäure

Syn. Hydrogen fluoride, Fluoric acid.

M. W. 20.

P. Clear, colorless fuming corrosive liquid. Very dangerous to handle. Dissolves the nails and produces terrible sores if allowed to come in contact with the skin.

Der. Calcium fluoride is treated with sulphuric acid, the mixture distilled in a platinum retort. Hydrofluoric acid gas passes over and is dissolved in distilled water.

G. Technical. 52% HF.

A. P. 85 cents per pound (packed in special ceresine wax bottles).

U. P. Its principal use in photography is for stripping films from glass plates, a 2 to 3% solution being used. It is also used in hyalography or photographic etching on glass.

ACID LACTIC, $CH_3CHOHCOOH$

Fr. Acide Lactique; Ger. Milchsäure

Syn. Acid alpha-hydroxypropionic and acid ethylidenelactic

M. W. 90: Sp.G. 1.2485.

Sol. in water, alcohol and ether.

P. Yellow or colorless thick liquid.

Der. Obtained very largely from sugar by the lactic ferment.

G. U. S. P. 75% lactic acid.

A. P. 89 cents per pound.

U. P. Occasionally used in the preparation of silver lactate positive emulsions. Acts as a preservative for slow chlordie emulsions and prevents fog. Is a useful preservative for amidol developer in the proportion of 5cc. lactic acid to 1000cc. developer. A 3% solution can be used as a stop bath for arresting development.

ACID NITRIC, HNO_3

Fr. Acide Nitrique; Ger. Salpetersaure

Syn. Aqua fortis, Hydrogen nitrate, Acid azotic.

M. W. 63.02: Sp. G 1.42: B. P. 86°C.

Sol. in water and alcohol.

P. Transparent, colorless, fuming, suffocating, caustic and corrosive liquid. Causes very painful burns.

Der. Prepared by distillation from saltpetre and sulphuric acid.

G. U. S. P.

A. P. 56 cents per pound.

U. P. Nitric acid is the principal ingredient in the nitration of cotton for nitrocellulose. Used as a preservative in pyro developer. Used in the production of silver nitrate and in some of the vanadium or iron toning baths. In process work, nitric acid is largely used as a mordant for etching zinc.

ACID OXALIC, $CO_2H.CO_2H.2H_2O$

Fr. Acide Oxalique; Ger. Oxalsaure

M. W. 126.05: Sp.G. 1.653: M.P. 187°C

Sol. in water, alcohol and ether.

P. Transparent, colorless crystals; poisonous.

Der. Sodium carbonate, heated under pressure with carbon dioxide, produces sodium formate, this heated with sodium carbonate, yields sodium oxalate. A calcium salt is added to precipitate calcium oxalate which, when treated with sulfuric acid, gives oxalic acid.

G. C. P.

A. P. 77 cents per pound.

U. P. Used in the sensitizing of platinotype paper. As a preservative for pyro developer. Used for making corrections on blueprints, as it dissolves the prussian blue image. Used in the preparation of ferrous oxalate developer. With some developers oxalic acid acts as a restrainer.

ACID PHOSPHORIC, H_3PO_4

Fr. Acide Phosphorique; Ger. Phosphorsaure

Syn. Ortho-phosphoric acid.

M. W. 98.06: Sp.G. 1.750: M. P. 38.6°C.

Sol. Miscible in all proportions with water and alcohol.

P. Clear, colorless, syrupy liquid.

Der. Obtained by oxidizing white phosphorous first air in and then with nitric acid and evaporating the solution.

G. U. S. P. 85 to 88% phosphoric acid.

A. P. 60 cents per pound.

U. P. A 20% solution of phosphoric acid is frequently employed for acidulating platinum toning baths and in the preparation of silver phosphate emulsions.

ACID PICRIC, $C_6H_2(NO_2)_3OH$

F. Acide Picrique; Ger. Pikrinsalpeters

Syn. Acid picronitric, Trinitrophenol.

M. W. 229.05: Sp.G. 1.767: M.P. 122°C.

Sol. in water, alcohol and ether.

P. Very poisonous and highly explosive, especially when in contact with metals or metallic oxides. Yellow crystals.

Der. By the nitration of monochlorobenzol in presence of sulphuric acid.

G. U. S. P.

A. P. Price constantly fluctuating.

U. P. Used in the preparation of non-halation plates and is sometimes used for making color filters.

ACID SALICYLIC, $C_6H_4(OH)$ (COOH)

Fr. Acide Salicylique; Ger. Salicilsäure

Syn. Acid ortho-hydroxybenzoic.

M.W. 138: Sp.G. 1.483: M.P. 156°C.

Sol. in alcohol and ether; Ss. in water.

P. White crystals.

Der. By the addition of hydrochloric acid to a solution of sodium salicylate, then by filtration and drying, purified by sublimation.

G. U. S. P.

A. P. 48 cents per pound.

U. P. Used as a preservative in emulsions and for the preservation of mounting paste.

ACID SULPHURIC, H_2SO_4

Fr. Acide Sulfurique; Ger. Schwefel Säure

Syn. Oil of vitriol.

M. W. 98.09: Sp.G. 1.84: M. P. 10.46°C.: B. P. 210 to 338°C.

Sol. in water with evolution of heat.

P. Strongly corrosive, dense, oily, liquid; colorless when pure. It is intensely corrosive and chars all organic matter which it comes in contact with In mixing always add the acid slowly to the water, not the water to the acid.

Der. Made by Chamber Process by roasting pyrites or sulphur in specially designed furnaces, or by the catalytic process, the raw materials in this process being sulphur dioxide from pyrites, or sulphur and oxygen from the air to produce sulphur trioxide which is absorbed in water yielding sulphuric acid. The catalyzers most in use are spongy platinum and iron oxide. Purified by distillation.

G. U. S. P.

A. P. 60 cents per pound.

U. P. Sometimes used as a preservative in pyro developer. Used in conjunction with nitric acid for the preparation of nitricellulose. Is one of the ingredients in the various permanganate, persulphate, bichromate of potassium bleaching and reducing solutions.

ACID SULPHUROUS, H_2SO_3

Fr. Acide Sulfureux. Ger. Schweflige Säure

Syn. Sulphur dioxide, Sulphurous anhydride, Hydric sulphite.

M. W. 83; Sp. G. 1.025.

Sol. In water.

P. Colorless liquid with suffocating sulphur odor.

Der. Pyrites are calcined and the gas absorbed in water, the liquor then concentrated by means of a still.

G. U. S. P. (6%).

A. P. 25 cents per lb.

U. P. Sometimes used as a preservative for pyro developer and to acidify the fixing bath. It must be freshly prepared as on keeping it very quickly changes into sulphuric acid.

AGAR-AGAR

Fr. and Ger. Agar-Agar

Syn. Japanese gelatine, Chinese isinglass, Layor Carang.

P. Transparent strips similar in appearance to shredded gelatine.

Der. Agar-Agar is a gelatinous vegetable material made from several of the white sea weeds (gracilara lichenoides and eucheuma spinosum.) These sea weeds are found principally in the Pacific and Indian Oceans and the Japan Sea.

G. U. S. P.

U. P. Agar-Agar has been used at different times as a substitute for gelatine in emulsion-making. It is, however, more difficult to melt than gelatine and a good deal harder to handle. It has been used as a substitute for arrowroot in the preparation of silver paper. In process work Agar-Agar is sometimes used as a substitute for fish glue in the process of preparing the resist for etching.

ALBUMEN

Fr. Albumine Ger. Albumen

P. Almost colorless gummy liquid, which dries to a pale yellow solid simiar looking to many of the gums.

Der. Is an exceedingly complex organic compound and is obtained from blood, milk or eggs. In photography, only the egg albumen is used. This is prepared by separating the fresh white of egg from the yolk, diluting with water, beating to a froth, filtering and evaporating. Albumen is coagulated by heat at 65.5°. C. It is also coagulated by alcohol and most inorganic salts. It is easily decomposed and must be used directly after preparation, otherwise a preservative must be added.

G. Technical.

U. P. Used in the preparation of albumenized paper and various positive processes. In process work is used as a substratum, and is used in conjunction with potassium bichromate for sensitizing zinc plates in photo etching. Albumen also has the property of clarifying solutions of gelatine.

ALCOHOL ETHYL, C_2H_5OH

Fr. Alcool Ethylique Ger. Aethylalkohol

Syn. Grain alcohol, Fermentation alcohol Cologne spirits, Spirits of wine, Ethyl hydrate.

M. W. 46: Sp. G. .785: M.P. —112.3° C.: B.P. 78.4° C.

Sol. in water, methyl alcohol and ether.

P. Colorless, volatile liquid. vinous odor.

Der. Prepared by fermentation of the sugars derived from starch.

G. Cologne spirits containing 95 to 96% alcohol.

A. P. $5.00 per gallon.

U. P. Used in the preparation of collodion and sometimes in the manufacture of celluloid; is frequently used as an addition to photographic emulsions, where it acts as a preservative. When present at the time of emulsification has considerable influence on the formation of the silver halide grain, keeping it fine and uniform.

ALCOHOL METHYL, CH_3OH

Fr. Alcool Méthylique Ger. Methyl Alkohol

Syn. Wood alcohol, Wood naphtha, Methyl hydrate, Columbian Spirits.

M. W. 32: Sp.G. .7913: M.P.—97.8° C.: B.P. 66.78° C.

Sol. In water, alcohol and ether.

P. Colorless, volatile liquid, highly poisonous.

Der. Obtained by the destructive distillation of wood. Purified by rectification.

G. U.S.P.

A. P. $1.00 a gallon.

U. P. One of the solvents frequently employed in the manufacture of celluloid. Is an excellent solvent for resins. Is sometimes used to prepare very concentrated solutions of developers. Used for denaturing ethyl alcohol. Its use, in connection with photographic emulsions, is dangerous, as it produces fog.

(To be continued)

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The Washing of Negatives

Many contrivances have been suggested for convenient and economical removal of the excess of hypo in the fixed plate, film or paper. In many American cities, water waste is not seriously controlled and the photographer, whether amateur or professional, allows the stream to flow freely, but in many foreign cities the supply is metered, or so limited that care must be taken in its use. It is generally known that the bulk of the hypo is removed from plates and films early in the washing, but even small amounts will, in time, discolor the picture. In dealing with negatives, the removal is not very difficult, but the exact amount of fixing and washing required for paper is not so easily determined. A slow, steady current of water flowing over the plate is probably better than simple changes, but it would seem that a siphoning method on the principle of the Tantalus cup would be very satisfactory. In this the water is allowed to rise to a certain height, when a siphon acts and empties the tank almost completely, a slow current running in all the time. In a recent issue of *La Revue Française de Photographie,* Louis Lumière describes, at some length, a method that he has worked out. It depends on the capillarity of a cotton wick. This is connected with a flat dish of the ordinary shape, and attached to a cotton mat laid on the bottom of the dish. This mat is well impregnated with water. The dish is then filled to a convenient point and the plate to be washed laid, coated side down, on the mat. Contact between the plate and the mat and between the mat and the bottom of the dish should be free from bubbles of air. In the apparatus used by Lumière the water is contained in a small reservoir at one end of the dish, and to secure the action, the dish is held up at a considerable angle, the reservoir at the top. The water from this reservoir can only pass out by the capillary action of a cotton wick attached to the mat, and the water which soaks thus into the mat flows away steadily by a small opening at the bottom of the dish. Lumière states that he has thoroughly washed a plate 9 x 12 cm. (about the size of the old quarter-plate) in 12 minutes, using only 30 c. c. (about 1 fluid ounce) of water. An advantage is that in this apparatus a few fragments of ice may be placed to secure the washing at a low temperature. An idea of the action of arrangement may be obtained by trying it with a gelatinized plate tinted with some substance that does not have a firm hold on the gelatin. The gradual disappearance of the tinting substance can then be noted.

New Applications of Stereoscopy

Attention has already been called in THE PHOTOGRAPHIC JOURNAL OF AMERICA to the increasing interest that is being taken on the continent of Europe, especially in France, in stereoscopy. A recent issue of the *Bulletin of the Vaudois Natural History Society* describes the use of the stereoscopic principle to the detection of the extent and form in the progress of the front of a glacier. It has long been known that a glacier moves down its valley by a very slow motion, and that when the amount of melting equals the amount of progress, the limit of the mass is reached, and it ceases to advance or retreat. If it happens that the temperature is above normal, the face of the ice-mass withdraws up the valley; if below normal advances upon the hitherto unoccupied area. For determining the changes of contour, a member of the society above mentioned has found it satisfactory to take two pictures from the same point at several months interval, and mounting these like stereoscopic prints, view them with an appropriate instrument. The superposition of one view on the other is said to give a vivid idea of the alterations that have occurred in the face of the glacier. It is obvious that care must be taken to place the camera in the same position on each occasion, and this position should be chosen

far enough away from the ice-mass to ensure that the movement of the latter, will not prevent the second picture being taken from the same point as the first.

Another application that has been made on the same principle is to take two photographs of a given star-area, with intervals of a day or so between, and mount these as a stereoscopic pair. Here, again, close accuracy must be observed as to the point of view, but this is not difficult. On viewing the two pictures any independent movement of an object, as compared to the mass of visible stars, will be evident. Astronomical observatories are now fitted with apparatus for this purpose. It is so arranged that the two pictures are alternately illuminated with very rapid changes, by which means the smallest difference is perceived. When such pictures are taken of one of the planets visible to the naked eye and both viewed at once in an ordinary stereoscope, an impressive effect is seen, for the planet stands out in the middle distance, while the fixed stars are in far background. The effect is, of course, an optical illusion, but is very interesting.

Platinum Conditions

The enormous advance in the price of this metal in late years has proved very embarrassing to chemists and to several industries. This advance has unfortunately contributed to additional difficulty because it has diverted the metal to a use for which it is really not adapted, namely, jewelry. There is no reason to doubt that the practice of setting precious stones in platinum has been adopted because of the high cost of the material, for it has a poor lustre and does not set off the stone as well as gold. George F. Kunz has recently reviewed the conditions of the platinum supply and uses, and some of the data that he sets forth are here noted, being taken from recent issues of the *Chemical News*. The industry is gradually emerging from the chaotic condition into which it was plunged by the war, and even the Russian sources are beginning to be active. A notable increase of production is also recorded in Colombia, the locality, by the way, in which the metal was first detected. The Colombian mines were actively exploited while the Russian mines were blocked, but American companies are now endeavoring to stabilize the South American sources. The price of the metal has fallen somewhat, though still very high. An increased demand for jewelry and dental work has arisen since the close of the war, which tends to keep up the price. In 1920 the consumption of platinum in the United States was 141,041 troy ounces, of which 57 per cent was taken by jewelers, 19 per cent by electrical industries, 11 per cent by dental industries, 10 per cent by chemical operations, the remainder being distributed in minor lines.

Naturally, active search has been made for new platinum deposits, but so far no great rewards have come. Kunz states that the outlook for some Alaska exploitations is rather encouraging. In Colombia, the principal deposits are in the Atrato and San Juan Rivers, but a third river is regarded as likely to yield a supply. The United States is about to pay Colombia a large sum as indemnity, and it is hoped that much of this will be used to develop some of the Colombia industries, especially the platinum deposits. Undoubtedly a marked fall in the cost of platinum will be a great advantage to chemists.

Background Perspective

The laws of perspective are simple and interesting, the more on account of their simplicity. The painters of the middle ages often violate the principles of perspective. A few only, who possessed a keen eye for observing the effect of distance on the form and shape of things, do draw correctly, but perspective, as an art asset, was not appreciated by European painters until the Renaissance, although it was known to the ancients in the fifth century B. C. The tragedies of the Greeks had stage settings representative of architecture in perspective. Democratus published a treatise on perspective, but the art had to be rediscovered in the 15th century of our era.

In accordance with the structure of our eyes, the height and general dimension of all objects diminish in proportion to the distance from our established point of view, and all lines parallel to the visual ray seem to converge towards a point of the horizon to which the eyes are directed: some being lowered, others elevated.

The perspective representation of an object consists in drawing it as would be done by placing a sheet of glass before the eye at right angles to its axis, the head kept fixed, the pencil tracing the object on the glass. This is just what the lens does on the ground-glass of the camera.

If the line of sight is elevated, a line running across the plane of the picture

would be high, if the point is depressed it is low. If we critically consider any regular shaped object, a long table for instance, and look from one end to the other, the further end looks smaller and the lines joining the two ends seem to slant.

Stand at a corner of the table, and we see that the further leg on each side looks shorter than the nearer ones.

If we look at the walls of a house, the boundary lines slant away towards one another, so it is with railway tracks on a level stretch, they appear to converge and also to rise till they get to the level of our view.

In studying the pictures of painters the photographer learns that the picture must be considered as a plane placed vertically; he sees first a fundamental or ground line, the base of the picture, then the horizon line on a level with his eye, a line which determines the position, as above or below, of the objects in the pictures; then a vertical line cutting the other two at right angles. The point of sight and the horizon line being determined, next measure the distance at which to place yourself to see the picture as seen to the natural vision.

These are the lines and points in the construction of linear perspective. But the photographer must also take account of the numerous exceptions, certain objects may present which have no regular relation to the picture, as for instance a chair overturned, which cause the horizontal lines to terminate at some accidental point upon the horizon. Such, in brief, are the elementary principles of perspective and all that is further needed is to show their application to photography when backgrounds are introduced as settings for portraiture.

The landscape scene forms a beautiful accessory to figure studies, but a good deal of caution is necessary when it is introduced to effect congruity of relations. There is still considerable abuse of the landscape background, but this should be no cause for its relegation to desuetude.

The scenic artist may paint a lively scene, but it may be just the worst possible setting to the portrait, and the photographer is often allured by it, to the shutting of his eyes to its inappropriateness. Sometimes the illumination of the scene is the opposite to that of the model and with disastrous result.

The point of sight, be it remembered, is always upon the horizon; but upon what point, in the middle, to the right or to the left? Here the photo-artist must take account of the sentiment. Many of the painters who have landscape backgrounds in their portraits fix the point of sight at the centre or at the intersection of the diagonals. This gives dignity from the symmetry effected, a reposefulness to the portrait.

But we see some excellent results when the point of sight is at only a short distance from one of the margins—which presupposes the spectator to be, in a corresponding position, but on the whole the central or near central position is productive of the best results in photography. It gives a sort of pleasing equilibrium—and at times much animation, when there is action indicated in the pose, or heightens the repose of a subject by suggesting completeness.

Photo-Chemical Reversal

The subject of photography in natural color is attracting much interest, and experimenters in this line are often in the dark about the behavior of certain chemical bodies which act in peculiar ways under the influence of light.

The literature on the subject is somewhat restricted, or confined almost exclusively to the strictly scientific publication, so that little information relative to the subject reaches the reader of the periodicals for the photographic profession.

Reversal of image, for instance, presents some facts well worth the knowing which are not easily accessible. Mr. Lueters, in *Photo Kronik*, has brought together some of the facts relating to the phenomena of reversal.

If paper is coated with a saturated solution of bismuth chloride, on exposure to sunlight, it speedily turns brown, but if the exposure is continued, the paper is restored to its pristine condition. Potassium ferrioxalate spread upon paper colors up to a brownish yellow tint by reduction to a ferro-salt. The image thus formed may be intensified by action of a platinous salt or by use of silver nitrate, molibinate of ammonia, potassium bi-chromate, or pyrogallic acid. On being kept in the dark, the undeveloped image may be preserved, or rather remains unchanged, but eventually disappears and is not developable by any of the above salts. Besides the combination formed in the dark is not sensitive to light.

But if a paper prepared as above is exposed under a negative and then removed and kept from the further action of light, it is found on application of a developing solution, formed of any of the above-mentioned salts, that instead of the expected positive image a negative one is formed. In other words, there is a reversal of image produced. In further connection may be mentioned the following:

If paper be coated first with a solution of potassium ferri-oxalate, dried and then with a concentrated solution of ammonium sulpho-cyanide, we have a reddish brown surface, which on exposure to light, bleaches in a very short time, but on removal to the dark, the original color of the sheet is restored, and if kept in the dark for a long time, this color is greatly intensified. The aqueous alcoholic or ethereal solutions of the ferri-cyanides color on exposure of a few minutes. In the dark restoration is effected, but action of the air is necessary.

This reversing action is also manifest in the sulpho-cyanides, and especially under concentrated light. Gold sulpho-cyanide discolors on exposure, taking on an intense red color, which entirely disappears on removal to the dark. Sulpho-cyanides of ammonium and potassium behave in like manner. Molybdenum teroxide in sulphuric acid, on exposure, changes to a blue green, but is restored by keeping a little while in the dark. A current of air seems to be needed to produce the effect. Ammonium molibinate spread on paper changes to a green tint on exposure. The presence of an organic acid changes this green to blue; both colors fade out in the dark.

Orthochromatic Plates in Portraiture

Although practically every intelligent photographer uses orthochromatic—or, as they are indifferently called, isochromatic—plates for certain classes of work, we believe that comparatively few appreciate to the full the advantage of employing them for the ordinary run of studio portraiture. Possibly this is due, in some measure, to the methods which have been adopted by writers and demonstrators to prove their particular qualities. For example, a bunch of marigolds and cornflowers makes an excellent test-object, the ordinary plate rendering the yellow flowers as if dark in color, and the deep blue ones as if nearly white, while upon the ortho' plate these tones are reversed, giving very nearly the actual visual effect. When a similar comparative test is applied to an ordinary sitter, the two negatives do not show this striking difference, especially if no color filter, or what is popularly known as an iso-screen, has been used, and consequently the advantage of using them has been questioned, and the "ordinary" plate has held the field.

In case there may be any misapprehension in the matter, it may be well to state that for any normal subject there is not the slightest disadvantage in using ortho' plates to the entire exclusion of ordinary ones, and, as the cost of the two kinds is the same, no economy results from choosing the latter. The only point which has to be observed is that the dark-room light is a pure red, and free from any trace of green or yellow. In most cases this requirement is already met, and, if not, it is a simple matter to fit a properly tested "safe-light" to the existing lamp.

Although the full advantage of the ortho' plate cannot be obtained unless a yellow, or greenish-yellow, color-filter be used, a considerable improvement in the quality of the negative can be obtained without it. In the case of very florid, sunburnt, or brunette complexions, a very long exposure is necessary with an ordinary plate to avoid a dusky appearance, but with the ortho' plate a slight increase beyond the normal will be all that is necessary. With badly-freckled skins, especially when these occur in conjunction with deep yellow or reddish hair, as is very frequently the case, it is very desirable to use a light yellow screen, which will necessitate doubling the exposure, but, when using a plate of 500 H. & D. this should prove no deterrent. With such sitters the improvement by so doing is most conspicuous. If a test for this be desired a group of two persons—one with a healthy tan and the other with a delicate pink and white skin—will convince the most incredulous. A great improvement is also obtained with white or very light draperies, although with these the best results are only to be obtained by using backed plates or films.

There are now many self-screened isochromatic plates upon the market, and these have been found to yield excellent results in the studio, being certainly better than the unscreened ortho' plate. From the nature of their manufacture a full exposure is needed to bring out their true capabilities, and few portrait negatives receive this. For this reason we recommend the use of a color filter, whether the ortho'

plate be a screened one or not. The cost of a color filter of good optical quality of sufficient size to be used with a large portrait lens is rather a serious item, and one of poor quality will impair the definition of the best lens. This has perhaps deterred many photographers from giving orthochromatic work a fair trial. Fortunately, there is a cheap and easy way of overcoming this obstacle. Most of the leading makers issue thin sheets of gelatine, dyed to the proper tint, at a cost of a few pence per square inch, and a piece of this cut to the requisite size may be fitted either inside the lens tube or mounted upon a cardboard cut-out immediately behind the lens. The former position is preferable, as the gelatine is protected from both atmospheric influences and finger marks or scratches.

It is when using artificial light that the full advantage of the color-sensitive plate is adequately displayed. The half-watt lamp is rapidly ousting other forms of illuminant, and has no disadvantages except the somewhat yellow tinge of the rays. This is entirely removed by the use of the ortho' plate, which is sensitive to such rays, and which in this case does not (for the ordinary sitters) require a color screen. It has been claimed that an iso plate bearing the same H. & D. number as an ordinary plate requires only half the exposure of the latter when used with half-watt lamps, and upon trial we have found the claim to be approximately correct. Those who have had much experience with arc lamps, particularly of the enclosed type, are aware of their unkind treatment of the freckled or red-haired sitter. Here, again, the ortho' plate scores if used with a pale yellow screen, which practically brings the light on a level with that emitted by the half-watt.

All the advantages of the ortho plate are, of course, possessed in even a higher degree by the panchromatic, and for very highly colored draperies, scarlet uniforms, and the like, these should always be used; but it is hard to persuade the average photographer to load and develop in absolute darkness, and therefore he is likely to use the ortho' plate for all subjects within its scope.—*British Journal of Photography.*

An exhibition of Pictorial Photography by the Orange (N. J.) Camera Club will be held in the rooms of The Camera Club, 121 West 68th street, New York, from July 1st to 31st. Admission is free.

Portraiture at the Camera Club

An exhibit from John Howard Paine, of Washington, D. C., occupied the galleries of the Camera Club, New York, during the month of June, 1922. His collection consisted of gum prints, interspersed with Iris and other renderings of portraits and figure studies. A very interesting feature was the inclusion of six pictures returned from the recent Photographic Fair held in London, England, which were received just in time to be hung with fifty-two others previously sent.

Mr. Paine's work is excellent in modeling, pose, textures and characterizations. Many of the gums were good specimens of that process, especially the multiple printings; but his other examples on ordinary papers fell nothing behind.

A number of the gum prints were in various colors. Many, perhaps the majority of pictorialists, hold the opinion that color does not lend itself well to portraiture; that black and white, with full scale, makes a more pleasing and natural presentation and enhances character rendering. In fact, the tendency seems to be away from color in photography and more and more to rendering black and white. This is a matter, however, for individual consideration and determination.

Mr. Paine's show was well attended, and little but praise was heard.

The pictures specially noteworthy follow: Two portraits of "Mrs. Warren Delano Robbins," one of which has been sold to *Vogue,* with all rights; "Portrait" (of an elderly man), "Michio Iton," "Portrait of a Violin Player," "Portrait" (8), "Miss Washington," "E. Hodgson Smart," "Portrait" (13), "Portrait" (22), "Bessie McCoy Davis," "Kay Launell," "Paul Porter," "Frances Pritchard," "Vanden Hoff," "Jorge Agusto Pigit," and "Grace Fischer."

FLOYD VAIL, F. R. P. S.

The Buffalo Camera Club held its annual election for officers on June 2, with the following results:

President, R. R. McGeorge; Vice-President, C. L. Moore; Secretary, C. R. Phipps; Treasurer, C. A. Pierman.

The club will hold its annual exhibition at the rooms of the Buffalo Academy of Fine Arts (Albright Art Gallery) during the month of March, 1923, to which all pictorial photographers will be invited to contribute.

C. R. PHIPPS, *Secretary.*

Meeting of the Technical Photographic and Microscopical Society

The Technical Photographic and Microscopical Society held a luncheon meeting at the Hotel Astor, New York, on Wednesday, June 14, which was attended by upwards of fifty members and guests. James McDowell, President of the Society, presided. Representatives were present from the Eastman Kodak Company, Bausch & Lomb Optical Company, General Electric Company, Western Electric Company, U. S. Bureau of Standards, E. I. du Pont de Nemours Company, and various research and testing laboratories.

After the minutes of the previous meeting had been read and approved, reports of committees were presented, A. E. Buchanan reporting for the Committee on Membership and Publicity.

John H. Graff, of the Research Department of the Brown Company, Berlin, N. H., made an address to the gathering in which he referred to the growing necessity of photography as a tool of industry, while photogrametry was said to be one of the most important adjuncts of engineering work. He made a strong plea for a large attendance and a good exhibit at the meeting to be held next September, which will be held in conjunction with the Eighth National Exposition of Chemical Industries. He said that an exhibition of work done with ordinary and special cameras would be of assistance to all who had already established photographic departments and would demonstrate the value of the work to others who could make use of photography for industrial and technical purposes.

Mr. Graff said that the problems of industrial photography lay in a higher field than that occupied by the average commercial photographer, and he cautioned against any confusion between techno-industrial photography and commercial photography.

Technical photography, he said, implied a knowledge of other sciences, as engineering, chemistry, physics, optics and mathematics. Subjects that might come within the purview of the new society were stated by him as follows:

1—Work done with ordinary cameras, as a tool of management, making photographic records of control and record boards, photographs of accidents and damages, photographs demonstrating evidence of waste and salvage, demonstration of safety ideas and accident prevention, and for copying drawings and documents, thereby saving time and labor, and in standardizing records.

The ordinary camera was used in numerous ways as a field instrument, and as a valuable aid to the engineer making process reports of construction, and illustrations for field investigation, trade reports, and industrial reports.

2—Photomicrographic and micrographic work. This work which formerly was only done by the scientist in pure research, was now being more and more used to solve daily commercial and industrial problems.

Mr. Graff pointed out that while metallography had long been a great factor in metallurgical development and research, photomicrography and macrography today also had a practical application in the cement industry and the scientific study of concrete, in the study of powder, dynamite and other explosives, as well as for the comparison of raw material used in the manufacture of drugs and chemicals. They were also used in studying gelatin and other emulsions, and in the industrial investigation of yeast cultures, bacteria, and moulds. Of great importance also was the use of photomicrographs in determining the particle sizes in paint and rubber pigments, etc., and it was used in studying the different tanning treatments in leather, and also in the vulcanizing rubber industry. But second only to metallography were, he said, the uses of photomicrographs and macrographs in both the textile industry and the pulp and paper industry.

The study of raw material or the finished product was, however, in his opinion, only a small part of the work; its greatest value lay in the ability to record and compare the results of the different chemical and physical processes of production.

3—Photographic work needing specially constructed equipment. The two former classes of photography could usually be done with instruments of more or less standard form sold by manufacturers or photographic equipment, but many industrial and technical problems in photography require specially designed apparatus and equipment of which it was only necessary to mention a few, illustrating the immense scope of this work, as for example, special equipment making it possible to take photographs of physical phenomena, and illustrating the workings of physical moving picture cameras, making it possible to study the detail of motions or the breaks or stress of physical tests.

Dr. C. E. Kenneth Mees, of the Eastman Kodak Company, discussed the work of the technical photographer, which he said was well worthy of a society such as that which had been formed under the name Technical Photographic and Microscopical Society. Problems of technical photography needed a medium such as that afforded by the new society and he was confident that all laboratories, in which photography was used, would be glad to co-operate; the laboratory of the Eastman Kodak Company for one

would, he said, be glad to assist in the work of the society. He predicted that through its activities it would accomplish much toward the improvement and progress of photography. He described several of the unusual and interesting problems that have been presented to the Eastman Company by technical and scientific workers. Among these were requests for special emulsions for astronomical observations and other highly scientific purposes. He described the research work done in the laboratories of his company to supply these special needs, and added that although the work did not always hold prospects of immediate profit, it frequently paid richly by the newly created field.

Miss Susan B. Leiter, who represented Dr. W. R. Whitney, director of the Research Laboratory of the General Electric Company, is the first lady member of the society. She was asked by President McDowell to address the meeting, which she did, by describing some of her work in the microscopy of metals, minerals and glass. If any argument were needed to convince one of the importance of photomicrography, it would be found, Miss Leiter said, in a visit to the microscopical laboratories at the General Electric Company's plant at Schenectady, N. Y. Often, she said, problems which are beyond the scope of any of the other research departments come to her for solution, and frequently the microscope proves equal to the task. Examples of unusual problems described were those of determining the reason for failure on insulation by photographing the ends of the fibers through the microscope and of photographing the inside surface of electric lamp bulbs.

Henry Green, manager of the Research Laboratory of the New Jersey Zinc Company, was invited to speak and he discussed the importance of microscopical work in the paint and rubber pigments industry. It was his belief that the society might be of great service to this industry if it would induce those engaged in it to employ the microscope in the analysis of pigments. He gave many details of the scientific use of the microscope and spoke of a special photographic lens used by him in reproducing microscopic particles of rubber and paint pigments. With the use of a special microscope, the particles of zinc oxide could be seen. It was thought to be a hopeless task, at one time, to identify particles of white lead under the microscope, but zinc oxide is smaller and lamp black the smallest, and both could be easily seen and photographed under special microscopical technic. He said the Society would benefit the paint and rubber industry if it would introduce to them microscopy as a science and not as a plaything to be dabbed in by untrained amateurs.

A draft of a proposed Constitution and By-Laws for the Society was read by the Secretary and after various amendments and revisions had been made, it was adopted in the following form:

Article I

NAME

The society shall be called "TECHNICAL PHOTOGRAPHIC AND MICROSCOPICAL SOCIETY."

Article II

OBJECTS

The objects of the Society shall be: (1) To stimulate interest in the science of technical photography and microscopy; (2) To provide means for the interchange of ideas among its members; (3) To encourage original investigation and the development of technical photography.

Article III

MEMBERSHIP

Section 1—Membership in the society shall consist of Members and Corporate Members.

Sec. 2—All applications for membership shall be presented to the Executive Committee.

Sec. 3—A candidate for admission to the Society shall make application on the form approved by the Executive Committee, upon which he shall write a statement, giving a complete account of his qualifications and experience, and an agreement that, if elected, he will conform to the Constitution, By-Laws and Rules of the Society.

Sec. 4—He must refer to at least three members of the Society, all of whom must sign his application and to two of whom he must be personally known.

Sec. 5—Election of Members: Four affirmative votes out of seven members of the Executive Committee are necessary to election.

Sec. 6—Each person elected shall subscribe to the Constitution and By-Laws, and shall pay the initiation fee and dues before he shall be entitled to the rights and privileges of membership.

Sec. 7—The dues of Members shall be $5.00 annually, with an initiation fee of $5.00, and of Corporate Members $25.00 annually.

Sec. 8—A member who has not paid his dues at the end of the year is suspended.

Sec. 9—Honorary Members: Honorary Members may be elected at any time by unanimous vote of the Executive Committee. They shall have all the privileges of members but without payment of dues.

Article IV

OFFICERS AND EXECUTIVE COMMITTEE

Section 1—The officers of the Technical Photographic and Microscopical Society

shall be a President, three Vice-Presidents and a Secretary-Treasurer, elected at the annual meeting by the members of the Society for one year, and an Executive Committee of seven members. The President, Vice-Presidents and Secretary-Treasurer, with two committee men shall constitute the Executive Committee of the Society.

Sec. 2—The present Executive Committee shall serve for one year, at the end of which time two members shall be elected as follows: One to serve for one year and one for two years.

Sec. 3—Vacancies occurring in any office shall be filled by a majority vote of the Executive Committee for the unexpired term.

Sec. 4—The President, Vice-Presidents and Secretary-Treasurer shall perform the usual duties of these offices.

Sec. 5—The Executive Committee shall pass on membership, conduct the business of the Society between meetings and have general charge and control of the affairs of the Society.

Article V

MEETINGS

An annual meeting of the Society shall be held at a convenient time and place each year, said time and place to be fixed by the Executive Committee. Additional meetings may be held as determined by the Executive Committee.

Article VI

AMENDMENTS

Any member may propose an amendment by addressing the Secretary. At the first regular meeting thereafter the subject shall be discussed, and if worthy, a written copy of the proposed amendment shall be sent to each member. The proposed amendment shall then be discussed in open meeting, and can be passed by a two-thirds vote by ballot of all the members of the Society present or voting.

BY-LAWS

Article I

PRESIDENT AND VICE-PRESIDENTS

Section 1—The President shall preside at all general sessions of the Society except as hereinafter provided. In the event of his absence or inability to serve, one of the Vice-Presidents, or in their absence a President *pro-tempore,* shall perform the duties of President.

Sec. 2—In the absence of the Secretary, the President shall appoint a recording secretary *pro tempore.*

Sec. 3—The President shall appoint all committees not provided for in the By-Laws or otherwise directed by the Society.

Sec. 4—He shall present at each annual meeting an address discussing such subjects as may to him seem suitable to the occasion.

Article II

OF THE SECRETARY-TREASURER

Section 1—The Secretary-Treasurer shall be elected annually and may receive an annual salary, and the amount of his expenses incident to meetings, in addition to his salary.

Sec. 2—He shall keep a fair and correct minutes of the proceedings of the general sessions and carefully preserve on file all reports, essays and papers of every description presented to the Society, and shall be charged with the necessary correspondence of a general as well as technical character, and with the editing, publishing and distributing of the printed reports and papers of the Society.

Sec. 3—He shall read all papers handed him by the President for that purpose; he shall call and record the ayes and nays, whenever they are required to be called; shall notify the chairman of every standing and special committee of his appointment, giving him a list of his associates, and stating the business upon which the committee is to act. He shall notify every member at least two weeks in advance of the time and place of each annual and special meeting.

Sec. 4—He shall present a statement of his accounts at each Annual Meeting that they may be audited.

Article III

OF THE EXECUTIVE COMMITTEE

Section 1—The business of the Society shall be in charge of the Executive Committee, which is empowered to transact business for the Society between the times of meetings.

Sec. 2—The Executive Committee shall consist of seven members—viz: the President, three Vice-Presidents, the Secretary-Treasurer and two members of the Society, elected according to the constitutional requirements.

Sec. 3—The Executive Committee shall be charged with the transaction of unfinished business of the Society from one annual meeting to another, and with collecting, arranging, and expediting the business of annual and special meetings.

Article IV

OF MEETINGS

Section 1—The meetings shall be held twice a year, in the Spring and Fall.

Sec. 2—Fifteen members shall constitute a quorum for the transaction of business at all meetings.

Sec. 3—The Spring and Fall meetings shall be held at such times and places as may be determined by the Executive Committee.

RULES OF ORDER

The ordinary rules of parliamentary bodies shall be enforced by the presiding officer, from whose decision, however, an appeal may be taken, if required, by two members, and the meeting shall thereupon decide without debate.

Article V

ORDER OF BUSINESS

The order of business at all meetings shall be determined by the Executive Committee.

Article VI

OF COMMITTEES

Section 1—The President shall appoint the standing committee of the Society, of which he shall be *ex-officio* a member.

Sec. 2—Special Committees shall be appointed as occasion requires but such committees shall be limited to the scope of the resolution under which they act.

* * *

The Society will admit between June and September, 1922, all applicants for membership who are interested in subjects of technical photography and microscopy, on payment of $5.00 as annual dues. A motion was adopted providing that all now enrolled or who join in the interval between this meeting and the September meeting shall be considered Charter Members.

Charles F. Roth, of the exposition management, offered a hall during the week September 11 to 16, for the use of the Society as a place for holding meetings and exhibits, and on his motion members were asked to provide exhibits from the various divisions of the Society. A. E. Buchanan, of the McGraw-Hill Company, Tenth Avenue and Thirty-sixth Street, New York, is chairman of the general committee on exhibits. The committee as tenatively formed is composed of the following divisions and members:

TEXTILES (New York)

W. O. Jelleme, Brighton Mills, Passaic, N. J., chairman; K. B. Cook, U. S. Rubber Company, 122 Adams Street, Newark, N. J.; B. H. Foster, U. S. Rubber Company, 122 Adams Street, Newark, N. J.; D. G. Woolf, Editor *Textile World*, 334 Fourth Avenue, New York.

TEXTILES (Boston)

Russell T. Fisher, 45 Milk Street, Boston, Mass., chairman; E. D. Walen, Cotton Research Company, Inc., 1020 Washington Street, Boston, 18, Mass.; Arthur H. Grimshaw, textile chemist, 355 Cedar Street, New Bedford, Mass.

PAPER AND PULP

John H. Graff, Brown Company, Berlin, N. H., chairman; Thomas J. Keenan, 251 West 19th Street, New York; D. A. Smith, District of Columbia Paper Mfg. Company, Washington, D. C.

PHOTOGRAPHY

Frank V. Chambers, editor PHOTOGRAPHIC JOURNAL OF AMERICA, 636 Franklin Square, Philadelphia, chairman; J. A. Lucas, manager photo laboratory, McGraw-Hill Company, Thirty-sixth Street and Tenth Avenue, New York; Dr. Alfred B. Hitchins, Ansco Company, Binghamton, N. Y.; F. E. Renwick, E. I. du Pont de Nemours Company.

MICROCHEMISTRY

Dr. E. M. Chamot, department of chemistry, Cornell University, Ithaca, N. Y., chairman; Henry Green, New Jersey Zinc Company, Palmerton, Pa.; A. Zimmerli, Rhodia Chemical Company, New Brunswick, N. J.

METALLURGY

A. E. Buchanan, *Chemical and Metallurgical Engineering*, Thirty-sixth Street and Tenth Avenue, New York, chairman; Henry Green, research laboratory, New Jersey Zinc Company, Palmerton, N. J.; Geo. C. Hiers, National Lead Company, research laboratory, 129 York Street, Brooklyn, N. Y.

LEATHER

M. W. Cohen, Leather Manufacturers' Shoe Company, 77 Bedford Street, Boston, Mass., chairman; J. A. Wilson, A. F. Gallun & Sons Co., 203 Juneau Avenue, Milwaukee, Wis.

RUBBER

K. B. Cook, U. S. Rubber Company, 122 Adams Street, Newark, N. J., chairman; B. H. Foster, U S. Rubber Company, 122 Adams Street, Newark, N. J.

TESTING LABORATORIES

H. B. Gordon, U. S. Testing Company, 316 Hudson Street, New York, chairman; P. F. Wehmer, Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York.

EXPLOSIVES

Bennett Grotta, Atlas Co., Tamaqua, Pa., chairman.

PHOTOGRAPHIC APPARATUS

J. A. Scheick, Bausch & Lomb Optical Company, 200 Fifth Avenue, New York, chairman.

MICROSCOPY

Susan B. Leiter, Research Laboratory, General Electric Company, Schenectady, N. Y., chairman; E. J. Wall, 35 Bloomfield Street, Wollaston, Mass.

Before adjourning it was resolved, on motion of Frederic L. Babcock, editor of *Fibre and Fabric*, Boston, to accept the invitation of a representative of the Parks-Cramer Company, and visit a projection

laboratory at 130 West Forty-sixth street, New York, where a demonstration would be given by means of motion pictures of the carrier air system of humidification. The pictures were slowed down to show the swelling of the fibres and effects other of the humidifying system.

The list of those who registered at the first luncheon meeting of the Technical Photographic and Microscopical Society is as follows: Frederic L. Babcock, Ernest B. Benger, A. E. Buchanan, Charles Canarian, Frank V. Chambers, J. L. Christie, O. E. Conklin, K. B. Cook, Charles H. Davis, R. T. Fisher, B. H. Foster, T. Francis, John E. Garabrant, H. B. Gordon, John H. Graff, Henry Green, S. Gulbrandsen, A. M. Hageman, Charles Hallen, George O. Hiers, A. A. Hopkins, L. W. Hopkins, Dr. Herbert E. Ives, W. O. Jelleme, J. T. Keenan, Miss Susan B. Leiter, J. A. Lucas, James McDowell, P. McAllister, Dr. C. E. Kenneth Mees, R. M. Meiklejohn, W. P. Melville, E. C. Pitman, J. H. Ramage, F. F. Renwick, J. B. Romer, C. F. Roth, V. B. Sease, J. A. Scheick, C. E. Skinner, W. C. Smith, C. E. Snow, R. T. Stokes, Haakon Styri, C. L. Tarlton, D. G. Woolf and A. Zimmerli.

Three-Color Repeating Backs

Although color photography has been making fair progress during the last few years as regards the number of photographers taking it up, many have not done so owing to the greater expense as compared with monochrome. This is especially so with three-color work, for three plates to each exposure soon runs away with the money, and when making a beginning with any process mistakes often occur.

When I started three-color work myself I found it pretty costly, for an error in one plate meant the scrapping of three, so I looked round for some means to lessen the cost until I became more efficient. To that end I made myself a repeating back to fit my half-plate camera, so that I could make the three exposures on one half-plate. Although not very elaborate or showy it answered my purpose, and I took a considerable number of successful photographs with it.

The materials required are a strip of black velvet or plush, 13 inches by 7 inches. One piece of wood 12½ inches by 7 inches by ⅜ inch (three-ply is the best for this): two pieces of wood, 12½ by ½ inch by 3/16 inch, and two pieces 12½ inches by ¾ inch by ¼ inch. The frame of an old dark slide belonging to the camera to be used will also be wanted, but if no such thing is at hand a fitting must be made so as to attach the back to the camera.

Cut an opening 2 inches by 4¾ inches in the center of the large piece of wood (see diagram), and then glue the piece of velvet, making sure it is perfectly smooth over the surface, turning the two ends over.

When dry, the velvet should be cut out at the opening. The frame of the dark slide or fitting should be both glued and screwed on to the other side of the board so that the hole is central.

The strips of wood should now be fitted on top of the velvet: the narrow strips first and then the wider pieces. Glue them first and then pass screws right through.

The narrow pieces of wood should be rubbed down to the thickness of the rebate on the dark slide intended to be used, and so fixed on the board that the dark slide lies comfortably between them. The loop pieces are adjusted so as to hold the slide in place, but allow of free movement.

A mark should be cut in the top strip at the point where the center of the plate is central with the opening. A thin piece of wood may be glued along one end to prevent the slide from accidentally overrunning the edge. A small catch on the other end to hold the slide while the shutter is being drawn completes the apparatus.

When the dark slide is just inserted in the repeating back the first third of the

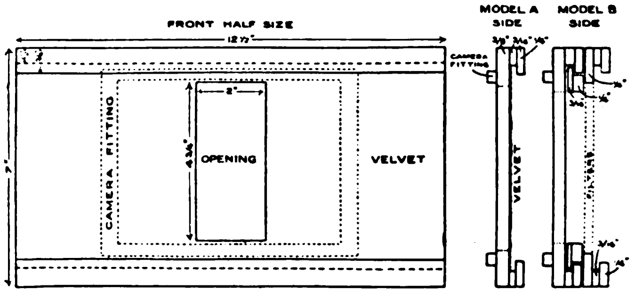


plate will be exposed. When pushed along to the mark the second third, and, at the farthest end, the final third will be uncovered. This will be found quite useful, and is intended to be used in conjunction with color filters on the lens.

A form which carries the filters just in front of the plate can be made with very little more trouble. Make just as for the first form, but omit the velvet. Then make a carrier for the filters as follows:—The wood wanted will be one piece each, 8 inches by 6 inches by 3/16 inch, 8 inches by 5½ inches by ¼ inch, and 8 inches by 7 inches by ¼ inch. Two pieces 8 inches by ½ inch by 3/16 inch, and two pieces 8 inches by ¾ inch by ¼ inch.

In the 7-inch pieces a half-plate opening is cut, in the other two the opening should be about ⅛ inch smaller all round. These three are glued together as follows:—The 6-inch piece, then the 5½-inch and then the 7-inch, the first two so that the edges of the opening are level, the top piece so that a ⅛-inch ledge is left all round for the screens to rest on. They should have a screw passed through at each corner. A shallow groove is cut right along the two narrow ends on each side about ⅜ inch wide, and narrow strips of velvet or plush glued in firmly to form light-traps. The strips of wood are glued along the edges of the wide piece as in the first model. This carrier is inserted in the groove in the repeating back and strips of wood fixed so that it will not come out. The screens are fixed in position in the carrier either by small metal clips or by strips of lantern binding glued along the edge.

To make sure that no stray light reaches the other portions of the plate while one is being exposed, fix a thin strip of wood along each side of the opening, so that they just touch the face of the screens. A coat of dead black should be given to all inside parts of the carrier.

The best form of filters for the last model can very easily be made. Obtain tricolor gelatine film from the plate manufacturers, size 4¾ inches by 2 inches, and fix between two half-plate pieces of glass, either by simply binding with lantern-slide binding or with Canada balsam, but this last is not really required in so small a size.

Of course, a good woodworker would get the same result by different means, but, as set out, any man that can use a few ordinary tools will have no difficulty in getting a good result.—*The British Journal of Photography.*

Printing

The ultimate purpose of the photographer should be the production of the print. This goes without saying and looks like a reiteration of a truism; nevertheless, it is the general practice of amateurs to concentrate attention upon the making of the negative as if it were the end of all of their effort. Rightly conceived, this is most praiseworthy, but they fail to appreciate what is a good negative. They fail to realize the power in their hands for expression in the variety of printing methods at their disposal. It takes some time before the beginner learns that he should set out with intent and purpose to make the negative solely for the medium he has chosen for the print.

True, there are various kinds of printing mediums which are accommodating in giving passable results with defective negatives, and by a series of trials, the photographer gets a sort of satisfactory print, but not what he would get if he had predetermined it. Finally he learns what a difference in results accrues, even with the predetermined negative. He discovers that with this efficient negative he is now in a position to make better use of the printing accommodation, thereby getting out of the negative all that is in it. He experiences the difference in appearance from printing in sun or in the shade and the difference in contrast and gradation.

As an object lesson, we would advise making from the same negative a series of prints on different media, and noting which best brings out the purpose sought for. The worker will, in this way, adjust relations between negative and print; he sees that with a certain medium, for instance, that the major number of good features is had by a little manipulation of portions of the negative (intensification or reduction locally) he gets what is most pleasing.

The great thing in printing, remember, is to know beforehand the effect wanted and to strive to get in the negative as near to this as he possibly can and not be satisfied till he can do this. Then he calls to his service the best printing agent.

The great thing to observe is the getting of the proper density in the negative, to give the paper opportunity to do what it is especially built for. The printing has to be humored to give its best, and it will, if you modify the good negative so that the printing has the best opportunity. We

mean this: You examine your negative. It looks just most suitable from the view you have on looking through it and you expect much therefrom, only to meet with disappointment in the resultant print. There is a nice contrast, rich gradation and good tonal value in your negative. Why is it that most of this is lost in your print? Simply because the proportionate density of the negative is such as is not accommodating to the exigencies of the printing process.

In other words, the printing under the negative has been such, that the shadows are disproportionally darkened before the highlight parts progress far enough and so you lose most of the gradations the negative has, because the effect of the light action is different from what the eye has by transmitted light looking through the negative.

Plainly put, the negative has been made a little too intense to accommodate itself to the printing. Either develop, so as to get this means of accommodation, and this we advocate above all, or try by local reduction to ameliorate conditions, which is not a good practice. A negative, for instance, may show proportionate density, say in the differences in the flesh tones of a portrait, the white collar of the model and the white drapery, but the print therefrom gives only one same white tone, no distinctions. Had you made the negative just a little thinner by proper development, you would have its tones in position to properly translate themselves in the print.

Photography of Stars in Full Daylight

In *L'Astronomie* for October, 1921, is a short article by M. Maurice Hamy on this. Experiments were successfully made by Messrs. A. F. and F. A. Lindermann, in England, in 1916. They succeeded in photographing stars down to the third magnitude near mid-day and indicated their belief that fainter stars might be photographed quite near the sun in a fine climate, *e. g.*, in in Kashmir or on Mount Wilson.

M. Hamy has performed numerous experiments with a small apparatus designed for testing the purity of the atmosphere at various localities. He concludes that with objectives of moderate aperture (as for example 13 inches) it should be possible to obtain clear images of stars down to magnitude 6, with an exposure of a half hour. Special plates, sensitive to the infra-red rays of light, and deep red filters to cut out all other colors, are required for this work and the atmosphere should be as free as possible from haze.

The particular problem to which this method may find immediate application is the testing of the Einstein hypothesis, that light rays are subject to deflection in passing through a gravitational field. The apparent direction of a star whose light just grazes the surface of the sun should be changed by nearly 2". If this method becomes successful for the fainter stars, it will not be necessary to rely on the few minutes of total solar eclipse for testing the Einstein theory.—*Scientific American.*

Telegraphic Transmission of Pictures

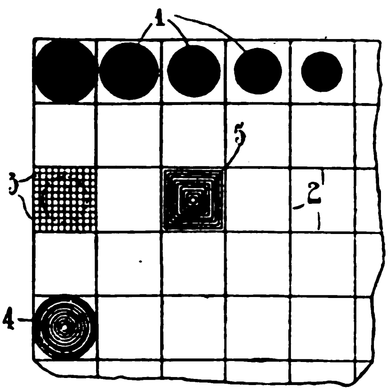
The British Journal of Photography tells of an invention that relates to the transmission of pictures by telegraphy, line or wireless, and is particularly concerned with pictures produced by process blocks, *i. e.*, pictures built up of dots equally spaced, and of a size varying with the degree of light or shade.

A series of signals corresponding with the various sizes and positions of dots is transmitted and utilized at the receiving end to print mechanically dots of corresponding size and position whereby a reproduction of the original picture is built up.

The picture is first enlarged to such an extent as to enable each dot to be readily recognized according to its size by an operator, who then transmits signals corresponding with the various sizes of dots which occur in sequence in a row, these signals being used at the receiving end to operate mechanism whereby dots corresponding in size and position to those on the original picture are reproduced, thus building up a picture corresponding to the original.

The invention also consists in means for enabling the dots to be readily recognized according to which two series of lines at right angles to each other are superposed upon the enlarged picture at the transmitting end so as to form squares of such a size that each will enclose a single dot and also enclosing fainter lines which form smaller squares or other figures whereby the dots may be classified at sight according to the number of these smaller squares or the like which a given dot covers.

There is first made a reproduction of the picture to be transmitted to a scale sufficiently enlarged to enable the dots 1 (fig. 1) to be readily classified at a glance according to their size. To facilitate this classification there is superposed on the picture two series of lines 2 at right angles to each other so spaced that the squares thereby produced shall each contain one of the dots 1 constituting the picture. Lines 3 more closely spaced than lines 2 may be also faintly printed so as to produce a large number of squares within each of the larger squares, or instead of employing faintly marked squares we may place within the squares formed by the lines 2 concentric circles as indicated at 4 or a series of squares of uniformly increasing size as indicated at 5, or any other form of faint ruling which may be found convenient may be employed. By this means it is possible for an operator with a small amount of



training readily to recognize the dots according to their size by observing the number of the faintly marked squares or the like which are covered by a given dot. The dots employed in forming the picture will be of a certain number, say ten, specific sizes, and on recognizing that a certain dot belongs to one of these sizes the operator would transmit a predetermined signal corresponding to the given size of dot. This signal may be received by any suitable form of mechanical receiver but modified, so that instead of printing letters, numerals or like characters, it will print a dot corresponding in size to that on the original picture. A series of signals may thus be sent, received, and the appropriate dots printed corresponding to the dots in one of the rows contained in the original picture. A second row of dots is then transmitted, and so on until the complete picture has been built up at the receiving end. This is then photographed and a process block prepared for reproduction of the required number of copies in the well-known manner.

The enlargement required for the transmission of the picture may be produced in any suitable manner, such for example, as by means of photography. For the sake of rapidity, however, it is preferred to employ an optical projection method whereby the picture is projected on a screen on an enlarged scale by an ordinary projection lantern, the squares containing the dots and fainter squares or other figures being also projected on the screen or printed thereon.

Automatic transmission of the signals may be attained by making an enlarged process block of the original picture, and utilizing the raised dots thereon as electric contacts whereby signals corresponding to the various sizes of dots may be transmitted automatically, thus dispensing with the necessity of an operator at the transmitting end to recognize the various sizes of dots occurring in sequence and then transmit corresponding signals. Such a method of automatic transmission is diagrammatically illustrated in the specification.

The Display of Screen-Plate Transparencies

At the present time, doubtless for reasons of economy, most color photographers working the screen-plate processes do so in the smaller sizes, such as 2½x3½ or ¼-plate. In course of time, as the collection grows, the worker finds it more or less of a problem to display the transparencies to the best advantage.

One of the chief difficulties in showing a collection of color transparencies to the best advantage is due to the fact that there is too much light in the ordinary domestic apartment to admit of the fullest impression being gathered of the brilliance and quality of the colors. Let the color photographer block up a small window somewhere in the house temporarily while the sun is shining upon that side of it on a bright day, thus darkening the apartment. Then let the worker cut out a rectangle in the blocking medium the exact size of his color photographs, and view the picture under these conditions. He will learn a number of useful things, and will most certainly find that a good color transparency is a very beautiful thing indeed, and also he

may gain an enhanced idea of the qualities of some of his own productions. Still, it is not necessary to have a darkened room in order to look at a collection of autochroms. Apart from this factor of prime importance, the light behind the transparencies should be white, strong daylight being, of course, the ideal. When the light is yellow or weak, the best effects in the color pictures will not be seen satisfactorily, while, upon a dull, winter afternoon, very little color can be seen even in the best of transparencies.

Next to daylight, white artificial light may be employed with satisfactory results; both electric light and incandescent gas have advantages as regards uniformity though with these all light, except that which comes through the pictures, should be minimized.

Much may be done to enhance the value of a good color transparency if attention is paid to the mounting of the pictures, and the photographer should be careful to mount the picture so that its back is shielded from direct front light. For transparencies of half-plate size and upwards, it is a good plan to have each one in an open frame of fairly deep moulding to isolate the picture from its surroundings and cut off light not actually needed to penetrate it. This frame is supported upon struts at an angle of about 45 degrees, and at the back of it is laid horizontally a white reflecting card or, better still, a mirror, to reflect the light up into the color picture. A specimen of this may, I think, be seen holding a portrait autochrom in the museum at the house of the Royal Photographic Society. If the front of the frame can be fitted with a simple form of hood, which need only be of stout card covered with American cloth, through which the transparency is examined, and the whole stood upon a table near a well-lighted window, no trouble will be experienced in getting a satisfactory view of the picture. This costs but little, and may be so made that the color transparencies may be easily changed. If the transparencies are only of small size, such as 2½ x 3½ inches, the frame may be larger, and a number inserted between two pieces of glass. In this latter case care must be taken to stop all light coming between the transparencies. If they are carefully arranged in, say, sets of a dozen or eighteen, a surprisingly attractive and brilliant effect will be produced, and, to my mind, there is no better way of displaying a collection of screen-plate color transparencies. If the photographer does not wish to go to the expense and trouble of fixing the two struts of a hood and reflector, as above suggested, the frames may be simply examined against the light in the usual way.

Another way of dealing with small color transparencies is to mount each one between two larger pieces of glass, the unoccupied spaces upon the glass being filled in with card-board the whole bound up with "passe-partout" binding, and a black paper mark fitted to the front of the transparency. This will serve in isolating the picture from its surroundings and assist in viewing.

Autochroms are often mounted in the folding mirror cases issued by Lumière for this purpose; the color transparency is placed at the top, and its image reflected into a mirror on the inside of the case. This method is entirely satisfactory: the picture is viewed without difficulty, and all surplus light is cut off by the sides of the case.

In conclusion, it may be remarked that at photographic exhibitions the color work has not been shown under fair conditions in the past years, even the R. P. S. itself not being above reproach in this direction. I for one am glad to read that the Council have given this matter their attention, and have devised a better method of showing the exhibits in this section, an announcement which should encourage a larger entry.—Robert M. Fanstone, in *The British Journal of Photography.*

Hydrosulphite of Soda

A. Steigerman has been reviving the interest in the use of sodium hydrosulphite as a developing agent.

As far back as 1886, Eder and Pizzihelli made use of it, but it was not received with much favor on account of the attendant dichroic fog.

The only application is in the physical development of gaslight paper, and even then only contrasty papers can be used. Steigerman points out a value in the hydrosulphite for precipitation of the silver from the hypo fixing bath. To each litre of the bath, 6 to 8 grammes of the hydrosulphite is added, with about the same quantity of sodium carbonate, gradually heated to the boiling point, till the hydrosulphite is decomposed. The hypo is so cleared of the silver that it may be again used.—*Photo. Industrie.*

An Announcement

The Haloid Company is pleased to announce that Mr. Frank N. Leache will represent them in New York City, beginning June first. Their business at the New York branch has grown to such proportions as to necessitate larger representation. Mr. C. H. Daws, the present manager, assisted by the efficient services of Mr. Leache, will enable them not only to care for the requirements of present patrons, but to bring to the attention of the entire professional and commercial trade of the metropolis, the splendid line of papers which this company is manufacturing.

Chestnut-Brown Toning of Bromide Prints

R. J. Gernotel describes in *Photo-Revue*, a process for the above purpose, which he states is superior to the ordinary sodium sulphide method. The image is permanent. The procedure is described as follows:

Immerse the print for about 5 minutes in a 0.1% solution of sodium sulphide. The image does not show appreciable modification, but the result is better than when this preliminary treatment is omitted. Wash the print moderately and bleach it in the following solution:

Potassium ferricyanide (red) ...	20 parts
Potassium bromide	30 parts
Water	1000 parts

Wash thoroughly to remove the yellowish tint given by this bath, then tone in a feeble light, with a solution containing:

Sodium sulphide	15 parts
Schlippe's salt	15 parts
Water	1000 parts

Wash again well and dry.

The Hypersensitizing of Autochromes

In a communication made to the French Society of Photography, Jové showed a series of four lantern slides, sensitized by different methods, three representing the same landscape. Of the latter, one plate was made to give a dominant green, the second a dominant red and the third a correct representation. The fourth slide showed a gamut of 132 shades. Pinachrome was used as a sensitizer for yellow, pinaverdol for green and pinacynol for red.

Green Tones on Silver Papers

Namias, considering that the uranium and iron solutions do not give sufficiently striking green tones, proposes to produce simultaneously in the picture a blue and yellow deposit. He accomplishes this by a mixture of iron and vanadium ferrocyanides, developed by the following bath:

Water	1000 c. c.
Potassium ferrocyanide (yellow)	10 grams
Vanadium chloride	4 grams
Pure hydrochloric acid	10 c. c.
Ammonium chloride	10 grams
Ferric chloride	5 grams

The tone will differ according to the duration of the immersion; the washing is carried out in running water.

A Method of Cooling the Motion-Picture Film

At a recent exhibition, in France, of improvements in motion picture apparatus for educational purposes, the firm of Gaumont operated a machine in which a current of air, under moderate pressure, was blown against the portion of the film exposed to the illuminating agent. The machine is so arranged that the lamp cannot be lighted unless this air-current is in action.

Other modifications of the projection apparatus were shown, among which is of interest to Americans a "cinevalise business," which is simply a compact case containing a projection apparatus and film, to be used by salesmen in exhibiting to prospective customers facts in regard to the products they handle. The idea is not wholly new, but the introduction of the English word as an adjective qualifying the word for valise is an evidence of how "dollar diplomacy" has penetrated the world.

Paris Notes

An Unpublished Niépce Letter

We owe to M. G. Cromer, well known for his writ'ngs on photography and an enthusiastic collector of documents relating to the history of photography, the rediscovery of an unpublished letter of J. Nicéphore Niépce. This letter, bearing the date of May 26, 1826, and addressed to Niépce's son Isidore, has hitherto been known only by a few lines quoted in Fouque's work of 1867, "La Verité sur l'Invention de la Photographie." It alludes to the images which for some time prior to the writing of the letter had been obtained by Niépce in the camera on pewter plates sensitized with Syrian asphalt. It was these results to which Niépce applied the description "points de vue d'après nature."

A New Example of the Russell Effect

The late Professor W. J. Russell, as is well known, made numerous observations some years ago on the effect of exposing a photographic plate in the dark in contact with pieces of wood, etc. By allowing, for example, a piece of wood to remain for a sufficient time in contact with the emulsion, an image was produced on the plate showing by the different densities the fibres of the material characteristic of spring and autumn growth. A Parisian engineer, M. Bardied, has obtained the same results with a sample of lignite which had become almost converted into jet, and thus was many thousands of years old. The specimen was obtained in the course of a visit to Madagascar. Two faces of the specimen were polished in a dark-room, one parallel to the fibres of the fossilised wood, the other perpendicularly to these fibres. Both surfaces, after contact "exposure" for several hours, showed a quite sharp image (more pronounced than in the sample itself) of the yearly rings in the wood and of the fibrous structure. The image was slightly more intense in the case of a second series of exposures made after exposure of the lignite to light.

M. G. Reboul, Professor of Physics in the University of Poitiers, has recently found that by wrapping a photographic plate in black paper and by bringing two byspring electric contacts on to the paper in such a manner as to produce a difference of potential of about 1,000 volts (the effect begins at about 200 volts) there is obtained after development an intense image showing the structure of the paper with considerable fidelity. The action is more pronounced towards the positive pole. Check experiments were made, so as to eliminate pressure of the terminals as a possible cause of the phenomenon and it would seem that successive falls in potential to points where there is discontinuity of resistance produce minute discharges, accompanied by radiation which is invisible yet exerts an action on the photographic emulsion.

Orthochromatic Sensitizing

About the year 1912, a French expert in orthochromatism, M. F. Monpillard, succeeded in increasing the sensitiveness of Autochrome plates to a considerable degree, about 30 times. In collaboration with M. L. Gimpel, a worker of great experience in the use of the Autochrome plate in Press photography, he obtained in good light exposures of the order of 1-100th of a second, and even was able to make slow shutter exposures of scenes on the stage under the ordinary theatre lighting. A number of these results were shown at the time at a meeting of the French Photographic Society, and were greatly admired. The process was also applicable to ordinary plates, conferring upon them both a greater degree of color sensitiveness in addition to general speed, and rendering them exceedingly effective for photography by artificial light. The extra-sensitized plates had, however, one great defect; they would keep for only a few hours, for not more than a day at the longest. M. Monpillard, however, hoped to overcome this difficulty. The method used for the extra-sensitizing was not published at the time, but a sealed packet descriptive of the principle was deposited with the French Photographic Society. Recent circumstances having prevented M. Monpillard from continuing his work, the contents of the packet have been published at his request, and it has been disclosed that the secret of this extra-sensitizing consists in the addition to the mixture of the usual isocyanine and carbocyanine dyes (pinaverdol, pinacyanol, etc.) of a small quantity of silver chloride previously dissolved in dilute ammonia. It is essential that as soon as the sensitizing bath has been used any adhering liquid shall be rapidly removed with a whirler and the plates dried by a rapid current of air.

Process Emulsions

The manufacture of emulsions of fine grain and great contrast, as required in photo-mechanical work, has long been neglected in France, but two emulsions for this purpose have recently been introduced. One of these is the "collodium" of Guilleminot, Boespflug et Cie., its name being chosen as an indication that the plate serves as a substitute of wet collodion. The other is a slow stripping paper, issued as "Rex," by MM. Michel, Paillot et Cie.

X-Ray Work

A Parisian medical practitioner of radiography, Dr. A. Zimmern, has recently observed that, without the aid of an intensifying screen, exposures may be made on X-ray plates with a reduction of about 35 per cent. in the time by previously heating the plate to 140 deg. F. Other conditions remaining the same, the same density is obtained on the warmed plate in this lesser time as that produced when working at 60 deg. F. Unfortunately, the installations

commonly used for X-ray exposures are not well adapted for making use of this observation.

Apropos of X-rays, it may be mentioned that a recent paper by M. F. Holweck, a student and collaborator of Madame Curie, has gone a long way to step the gap which hitherto has existed between ultra-violet and X-rays in the great series of waves propagated with the same speed as light. This experimenter has been able to produce X-rays of relatively enormous wave length (extra soft rays), forming a continuous series with the ultra-violet rays of very short wave length obtained in the United States by Millikan.

Stereo-photo-topography

An interesting demonstration has been arranged for the scientific section of the French Photographic Society by M. J. Prédhumeau of his stereo-topometer, the construction of which I mentioned a few months ago ("B.J.," January 13, 1922, p. 15). The two negatives are taken from two stations, the separation of which is preferably 500 times the average separation of the eyes. The exposures are made on the two halves of a slow fine grain plate in a stereoscopic camera provided with two lenses, which are alternately uncapped. The centre line at each exposure is parallel to the straight line joining the two stations, and the optical axes are horizontal and perpendicular to the line of the stations, the various adjustments being made by means of a theodolite serving as a support for the camera and by aid of a sight which for each exposure is placed at the station not occupied by the camera, that is to say the theodolite and sight, each on a tripod, exchange places between the two stations.

In using the negative thus obtained it is replaced in the same camera as that in which it was exposed so as to take up precisely the same position as that when the exposures were made. The camera is then placed in the stereo-topometer with the same inclination of the centre line as that which was given to it when making the exposures, this line being thus obtained parallel with the base. To each objective is attached a converging lens of 32 in. focal length, and the negative is observed from behind by means of a stereoscope having a magnification of about ten times, and fitted with prisms for reversal of the images. As a means of receiving in the stereoscope the light which comes from the objective, there is placed behind each of the elements of the stereogram a lens of planoconvex field having its focus at the exit node of the corresponding objective. The combining apparatus includes, in front of the photographic camera, a large frame turning on a vertical axis. A movable carriage on this frame carries with it a vertical rod, along which can be raised or lowered a "voyant" (a positive transparency of a flag or other design), lighted from behind. The various movements of the "voyant" are controlled partly with the hands and partly with the feet of the observer using the stereoscope. At the instant when the flag (an image of which is projected on to the negative by each objective) is seen to come, in the stereoscope, exactly on a point of the subject, the "voyant" then occupies in space the position where the subject appears to be reconstituted stereoscopically. Then by means of a pantograph connected to the "voyant" the lines of the subject or the horizontal sections of the ground showing the configuration of the latter can be traced on the plate. The great advantage of this apparatus is that all the registrations are done in the photographic camera used for taking the negative and not in the stereoscope, as is the case with the von Orel stereo-autograph. The whole construction calls for few exact adjustments; only the pantograph and its connection to the "voyant" require to be made with great accuracy.

Cinematography

A very ingenious system in cinematograph projection has just been worked out by M. Lenouvel, Professor of Physics in the Rouen High School. In seeking to simplify, for the purposes of his class instruction, the alternating projection of animated photographs and ordinary lantern slides, M. Lenouvel has at the same time obtained an improvement of more than 300 per cent in the light-efficiency of the projector. The light-box, carrying the 4½ in. condenser and the lantern slide carrier, are separated by the cinematograph mechanism. Between the two pieces of apparatus is an objective formed of two achromatic lenses, the adjustment being such that the image of the condenser or of a plane a little in front of the condenser (that is to say the surface of a slide placed in the carrier) is formed exactly in the gate. In contact with the latter, in front of or behind the position of the film, a plano-convex lens is arranged, transmitting to the projection lens the rays which, without this addition, would diverge

after passing through the gate. Under these conditions the whole of the light which passes the condenser is used for the projection of the picture. No adjustment is necessary when changing from cinematograph to ordinary projection. Lastly, when the apparatus is used for the projection of apparatus such as electroscopes, living specimens in tanks, etc., the image is projected on to the screen the right way up instead of being inverted as usual. It should be added that the whole apparatus resembles an astronomical telescope provided with a Dollond rectifier, the source of light occupying the same position relatively to the projection apparatus as the eye to this telescope.

A notable step forward has been made in the taking of high-speed cinematograph films by the G. V. camera made by the firm of A. Debrie, of Paris, from the designs of M. G. E. Labrély. Provided there has been great exactness in the perforation of the film (in which respect no latitude is permissible), this camera allows of taking up to 160 pictures per second when the handle is turned by hand at the normal electric drive from a small battery. The speed, or up to 240 pictures per second with camera can also be worked at normal speed, thus avoiding the cost and bulk of two separate outfits. The two film spools are contained in the same box, accommodating 400 ft. of film, a fresh box being fitted in five seconds. Inclusive of case, the weight of the camera is 29 lbs. The apparatus, which permits of prolonging the time of movement ten to fifteen times, has already rendered valuable scientific and industrial services in the analysis of rapid movements. Many of the cameras already constructed have been supplied to the United States.

M. L. Clement, a leading technical authority in the cellulose ether industry, has recently drawn up the report asked of him by the cinematograph section of the French Photographic Society on a ready method of comparing the qualities of films on different supports, that is to say a method which does not involve the chemical and mechanical tests employed by film makes, but is applicable by users and renters of film. The test for resistance which is proposed consists in making an endless loop of film about 2 yds. in length, consisting of equal lengths of the two films to be compared. These are cemented by their ends as perfectly as possible. The films, which should have been perforated of the same pitch on the same machine, and should also have undergone the same treatment as regards printing, development and drying. The loop is placed in an ordinary cinematograph projector, and is there arranged so as to receive a tension, by means of a roller mounted on a weighted lever, when the machine is put into normal operation. The motor of the projector is then put in action and an account kept of the number of times the band of film passes round. This is done by making a mark on the band. Every five minutes the machine is stopped and the perforation examined, and the test is completed when all the perforations of one of the two pieces of film are distinctly affected. Examination of the different fractures is then made, with the exception of those close to the junctions in the film. The number of times which the film has to be passed round in order to produce this result varies from 200 to 300 according to the quality of the projector, and thus two bands of film on the same support may be compared or, alternatively, two projectors may be compared by using identical film bands in each. The various causes which contribute to changes in the film with time can be greatly accelerated by placing the film in a heated atmosphere, temperature playing very much the same part as time. A similar test may then be carried out on a band of two films which has been exposed for about 120 hours in an oven at a temperature of 140 deg. F. The degree to which a film resists this application of heat serves as a useful indication of its keeping qualities.—L. P. Clerc *in The British Journal of Photography.*

Toning with Palladium

Palladium, one of the group of platinum metals, but even scarcer than platinum, has been suggested as a toning agent in a brief note in the *Photo-Revue*. It is stated that the action of the bath is regular, and even when containing but a small amount of the costly material, allows of toning many prints. The bath is constituted as follows:

Water	1000	c. c.
Common salt............	5	grams
Citric acid..............	5	grams
Palladium chloride.......	0.5	gram

The tone ranges from brown to brownish black, according to the time of immersion. The print is washed in running water. Palladium chloride is quoted at $3.00 a gram; the above solution has a volume of about 1 quart, so that the bath will cost about $1.50 per quart.

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PHOTOGRAPHING THE METAMORPHOSIS OF A BUTTERFLY—L. W. BROWNELL

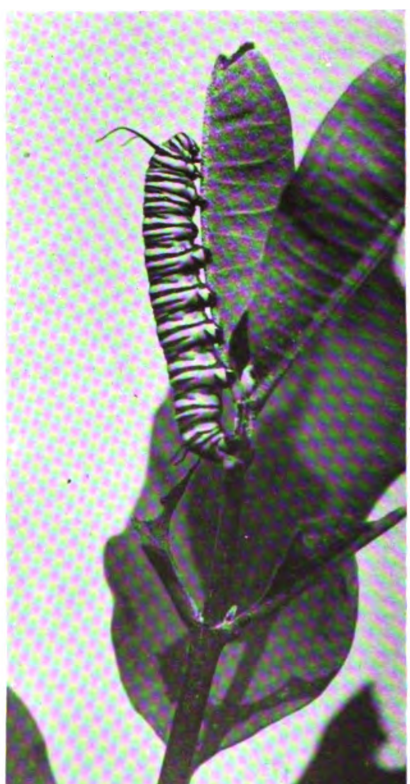
IN a former article I have written of photographing butterflies in the open and of the pleasures to be derived from such a chase, but butterflies may also be photographed in captivity, and, in many instances, this is much to be preferred to the former method. In fact, photographs may be obtained in this way that cannot possibly be taken in the open. In order to make successful photographs in this way, one must "hatch" his butterfly in captivity and make his exposures as soon as the insect has attained full perfection. At this time of the insect's life there is a period covering several hours, when it is entirely quiescent, and will remain absolutely motionless for minutes at a time. During this period, one may do his photographing indoors, if he prefers, and give time exposures, for there is little or no danger that his subject will move. Moreover, the butterfly, having but just emerged from its chrysalid, in the full glory of its new, unblemished wings, is in perfect condition and will, accordingly, make a much better subject than can possibly be found out-of-doors, for once having started on its short life among the flowers, a butterfly's wings soon lose their pristine beauty and become rubbed and broken.

We all know that a butterfly passes the first stage of its existence as a lowly, crawling worm, an object repulsive to most people and one that does more or less injury to mankind by its destruction of vegetation. It seems hardly possible that such beautiful creatures as the butterflies and moths can come from such a mean beginning, but Nature does some wonderful things, and the metamorphosis of a butterfly or moth is far from being the least of them.

The second stage in a butterfly's existence is known as the pupal or chrysalid stage, and the third as the imago or perfect insect.

The length of time consumed in this change, or metamorphosis, from the larvæ or caterpillar, to the perfect insect, differs considerably in different species. With some it occupies only a few weeks, while with others it covers as many years. Some species pass the winter in the larval stage by curling themselves up under a stone, log, behind a piece of bark or even hidden among the fallen leaves and hibernating. Others pass this season in the pupal stage and still others, but a much fewer number, as the perfect insect. Some have several broods in a single season, and of these is one of our commonest species, the Monarch Butterfly (Anosia plexippus), that large red and black fellow with whom all dwellers in the country are familiar. It is sometimes called the milkweed butterfly, for on this plant its larvæ feeds, and, accordingly, it is to be found most often in its near vicinity. Many broods of this insect are produced annually, and the entire time occupied by the metamorphosis does not exceed four to five weeks. Those individuals that are overtaken by frost, in either the pupal or larval stage, perish. With the advent of cold weather, the butterflies migrate southward, sometimes in huge swarms, and appear in the north again when warm weather comes,

If one would make a series of photographs, showing the various stages in



"FULL-GROWN LARVA OF MONARCH BUTTERFLY" L. W. BROWNELL

JOHN HOWARD PAINE

From the One Man Show at The Camera Club, New York.

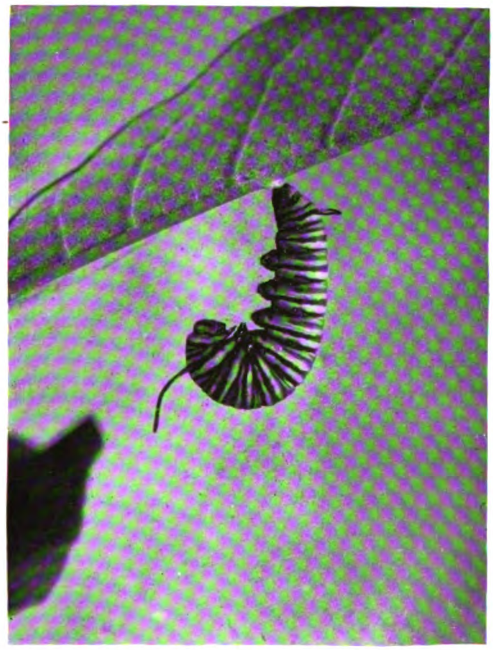
JOHN HOWARD PAINE

From the One Man Show at The Camera Club, New York.

the metamorphosis of a butterfly, this is the very best species that can be selected. It is one of our most common butterflies and its larvæ are easily found, and once having been found, are easily kept in captivity. The entire series may be made in a few weeks, which is a great advantage, and the insect gives some hint of what is about to happen just before each change, thus allowing one time to prepare his photographic apparatus. All of which makes the little Monarch butterfly a very satisfactory photographic subject.

Our first task is to find our subject, but this is far from being difficult. A search of two or three hours among the milkweed of the roadside and fields will surely result in the capture of as many of the caterpillars as we will need. These, we must always remember, must be handled as little as possible and with great gentleness. They should be carefully placed in a box and taken home with us, together with two or three stalks of the milkweed upon which we found them. It will be found unnecessary to keep these little guests of ours in a cage, for we will find that, so long as we keep the stalk upon which they are feeding fresh and green, they will have no desire to leave it.

If we are fortunate enough to secure some of our specimens soon after they have emerged from the egg, so much the better, for we will then have the opportunity to secure several snaps at them at different stages of their growth. This occupies from ten days to two weeks, and during this time they moult, or shed their skin, several times. When full-grown, they measure from two to two-and-one-half inches in length and are really handsome fellows, being



"LARVA HUNG TO PUPATE" L. W. BROWNELL

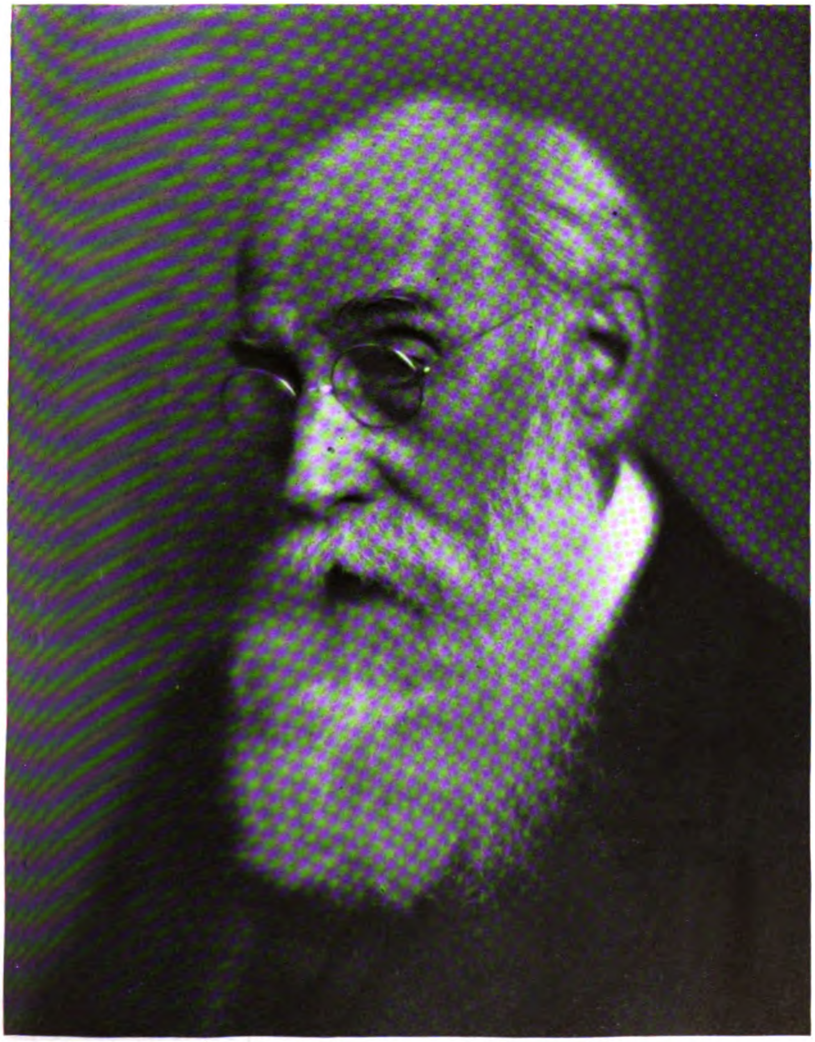
banded throughout their entire length with transverse alternate stripes of black, yellow and white. During this time they do nothing but eat, and all that they ask for to make them perfectly contented is to be supplied with a never-failing supply of fresh leaves. These we must see that they have and it is well to change the stalks every day or two at the most. They are gormandizers, but this is true of all caterpillars. With these, however, owing to the fact that their growth is much more rapid than is that of almost any other caterpillar, eating is their sole occupation during their entire life as a caterpillar.

Some day, however, when we visit them, we will find one restlessly crawling about the plant, stopping now and then for a few nibbles as though he could not give up all at once that which had been his life occupation thus far, then on again, occasionally raising his head to look about before continuing his tramp. His whole actions seem to say that he is looking for something which he does not appear to be able to locate This is, in reality, the solution of his actions, for he is searching for the most suitable place in which to pass the next period of his existence, the pupal stage.

This restlessness lasts usually for about a day, but he finally selects his spot, which is almost invariably the midrib on the underside of a leaf, and here he will proceed to hang himself by his tail, attaching himself to the leaf by means of a small quantity of a viscid, silky substance, which he spins out in much the same manner as a spider spins his web.

In this position, with body curled up like a hook, he will hang for about

"CHRYSALID EMERGING THROUGH SPLIT IN SKIN" L. W. BROWNELL



JOHN HOWARD PAINE

From the One Man Show at The Camera Club, New York.

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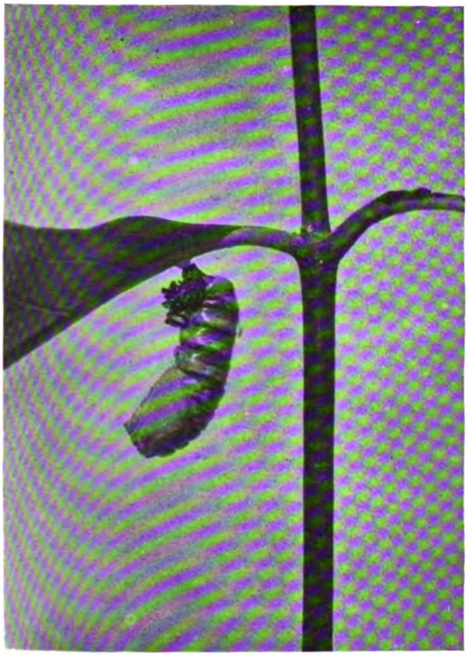
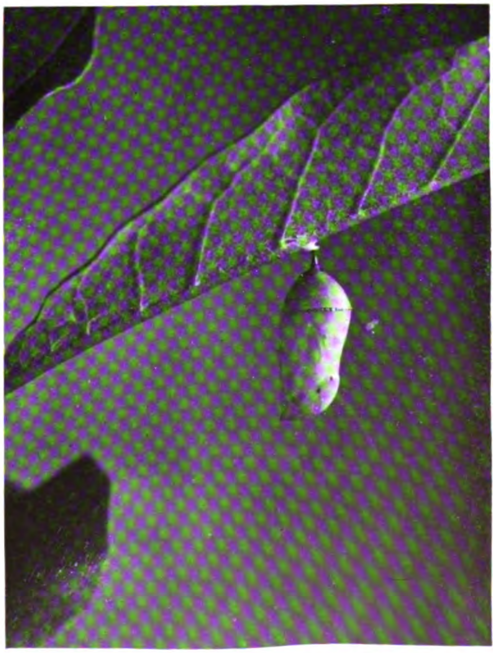
From the One Man Show at The Camera Club, New York.



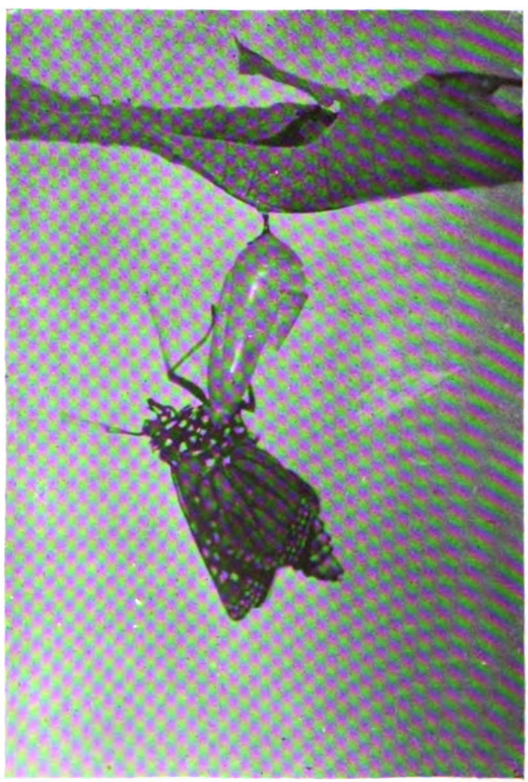
"CHRYSALID WITH SKIN IN A WAD AT TAIL."
L. W. BROWNELL



"THE MILKWEED JEWEL"
—PERFECT CHRYSALID OF MONARCH BUTTERFLY—
L. W. BROWNELL

twenty-four hours, absolutely quiescent, except when he or the plant is disturbed in any way, when he will show his disapproval of such actions by twisting and squirming about.

At the expiration of this time his body will commence to contract and expand longitudinally, the convulsions running over him in waves from his head to his tail. This is the signal for us to make ready to do some rapid work, and it will be necessary to have our subject in some spot where the light will be sufficiently strong to allow of exposures of not more than 1/50 of a second. These convulsions continue for about an hour, the body gradually straightening out until it is hanging perfectly straight and limp. Here we should make another exposure. The head, and that part of the body immediately back of it, now begins to swell until, with no further warning, the skin of the head splits and the chrysalid commences to emerge, pushing the now useless skin backwards from its body by a continuation of the convulsive movements, until it is contracted into a compact wad at the tail. This is held tightly between two segments of the body, while the extreme tip of the tail, armed with a hard, black hook, is withdrawn and the hook firmly inserted in the silky wad. The skin is then finally entirely rejected and the chrysalid hangs free. During this period we should have made as many exposures as possible,



"THE BUTTERFLY SOON AFTER LEAVING CHRYSALID SHELL" L. W. BROWNELL

The chrysalid now slowly changes in shape and color, until it becomes a veritable pendant jewel of green and gold. The handsomest chrysalid of the many thousand forms that our butterflies make and well deserving the name which is commonly applied to it: The Milkweed Jewel.

We must now possess our souls in patience for at least a week, possibly even longer, before we can continue our series of photographs, for it will be at least this length of time before there will be any apparent change in our little friend. At the expiration of this time, the chrysalid will gradually darken, the shell becoming transparent, until we can plainly see through it the markings on the wings of the imprisoned butterfly. This is our second warning to prepare for quick work, for suddenly the entire skin bursts open and the butterfly has escaped and is clinging to it almost before we have realized that it has happened. At this stage it is a most bedraggled and imperfect looking insect, and one would be forgiven for thinking that it was deformed, for the body is huge in comparison to the two crumpled-up wings that have no least resemblance to the beautiful things they will eventually become.

Gradually, as the juices from the body are injected into the wings, the latter straighten out until they hang smooth and perfect and the former shrinks until it has become reduced to the size of a normal butterfly's body. We can take what exposures we wish during this period, but I should suggest that we

"WINGS FULLY DEVELOPED" L. W. BROWNELL

take at least four or five before at last allowing out little guest to depart on his short life of joy and pleasure and some little usefulness.

Just a few words concerning the apparatus. We may use a reflex type of camera if we wish, but I prefer one with a tripod as giving a fixed focus, so that all the photographs may be uniform in size. The faster the lens, of course, the better. One working at *f*4.5 will give the best results. The image should be made approximately life size and all the different exposures uniform, as I have said. It is well to work against a plain background that there may be no confusion of detail. An orthochromatic plate, naturally, gives the best results as reproducing the colors more nearly in their natural tones. As it is not well to keep the insect constantly in the strong light necessary for the exposures, it is a good idea to have the whole set arranged upon a small table that can easily and quickly be moved to any position desired when it is time to make the photographs.

I have said to keep a number of the larvæ on hand in order to have one or more to fall back upon in case of an emergency, but it is always best to make the entire series from the same insects, if this is possible. The series should consist of from twelve to fifteen prints and will prove a most interesting addition to our collection of Nature photographs.

"THE PERFECT BUTTERFLY WITH WINGS SPREAD" L. W. BROWNELL

JOHN HOWARD PAINE

From the One Man Show at The Camera Club, New York.

JOHN HOWARD PAINE

From the One Man Show at The Camera Club, New York.

FLUORESCENCE AND PHOTO-CHEMISTRY

THE phenomenon of fluorescence has been long known, and experiment has revealed a large number of substances, natural and artificial, that exhibit it in greater or less degree. Among the natural substances that have marked properties are quinine and esculin, the latter being a crystalline principle in horse-chestnut bark. Some of the coal-tar colors show very high fluorescence, and, as is well-known, have been used in extending the sensitiveness of photographic emulsions. The generally accepted theory, as to the nature of fluorescence, is that the substances have the power to slow down the light vibrations that fall on them, thus bringing within the range of human vision, rays that are normally invisible, hence, the substances appear to giving out light. The phenomenon is different from phosphorescence, which is the power to emit light after the illuminating influence is withdrawn. Fluorescence is exhibited only while the substance is illuminated.

Dr. R. W. Wood, of Johns Hopkins University, who has done a great deal of original work in the field of optics, contributes to a recent number of the *Philosophical Magazine*, a study of this subject, which is of much value. It has been known for some time that fluorescent solutions are bleached by light. Perrin suggested that fluorescence is associated with chemical change, and not merely the purely physical phenomenon that the commonly received explanation, noted above, indicates. He has applied the modern theories of atomic and molecular structure to the problem, and suggests that the emitted light is due to "flashes" of exploding molecules. Perrin showed that thin films of fluorescein (a coal-tar color showing very high fluorescence), are bleached at the spot at which the light is focused by the substage parabolic reflector used in the examination of colloidal particles. It was found that other fluorescent substances are similarly bleached.

Wood's researches, which he reports in the article under consideration, were made in his private laboratory about two years ago and lead to views which are somewhat at variance with those generally accepted. Operating with an intense beam of light, obtained by concentrating sunlight by a lens 6 inches in diameter, fluorescent substances were bleached in such amount as to obtain some of the products of transformation. The time necessary for the complete bleaching differs with different substances. Eosin is quickly bleached; rhodamin requires several hours. The usual result is that light first produces a colored non-fluorescent substance and, later, a colorless one. For this reason, it is not possible to obtain the intermediate substance in a pure state, but by care, fairly satisfactory results can be obtained. Wood made his examinations principally by photographing the absorption spectra of the colors before and after the action of light.

Provisionally, the colored non-fluorescent products of the action of light have been called "photo-compounds." Thus, the result of this action on fluorescein is termed "photo-fluorescein." The original color, in this case, is yellow by transmitted light, but is changed in time into orange-red (non-

fluorescent), which gives an absorption band of a totally different form. Eosin is also changed, but the action of light is much more rapid. Rhodamin behaves in a curious manner. A solution, in water, is gradually bleached by light, without the formation of an intermediate substance, but in solution in methyl or ethyl alcohol, a strongly fluorescent intermediate compound is formed, which shows an absorption band quite different from that shown by the original material. The alcohol solution on evaporation leaves a solid, which, when dissolved in water, fluoresces just as did the alcoholic solution.

Temperature has in some cases a marked influence on fluorescence. Perrin, indeed, came to a different conclusion, but Wood found, for instance, that at the boiling point of water, rhodamin is almost non-fluorescent; the effect returns when the solution cools. Eosin, on the other hand, is not affected by temperature. The intensity of fluorescence is proportional to the intensity of the exciting light. It seems probable that the effect also will be much influenced by the amount of ultra-violet light applied. It must also be borne in mind that many colors, natural and artificial, perhaps all of them, are sooner or later bleached by light. Perrin's view was that the intensity of a given effect was dependent on the number of molecules broken up in a given time. It can, however, also be assumed that the molecules fluoresce to an equal degree, and that increase in the intensity of the applied light increases the amplitude of the resulting radiation, but while this is going on, the substance is steadily decomposing. It is also known, and is an interesting fact, that great concentration of the solution interferes with the fluorescence. The following experiment was made: Two solutions of eosin were prepared, one very strong, the other quite weak. Both were subjected to a powerful concentrated beam of sunlight for half an hour, care being taken to avoid appreciable increase of temperature. On dilution, the concentrated solution showed practically no production of the photo-derivative, while the dilute solution had produced a notable amount of this intermediate compound. A similar trial with rhodamin, however, did not give striking results. Experiments with eosin, exposed under different concentrations of light, showed that this color was affected much more thoroughly by the stronger illumination. The relation between the rate of change and the intensity of light is now under investigation in Dr. Wood's laboratory.

Notwithstanding the eminence and ability of the workers on this subject, an important point seems to be overlooked, namely, the nature of the action of fluorescent mineral substances. Uranium salts, for instance, are strongly responsive to light, and investigation should be made as to whether a small amount of uranium salt suffers change by long exposure to a powerful beam. The action of ultra-violet light, unmixed with ordinary light, such as can be obtained by Wood's method of transmitting the beam through a quartz plate or lens slightly silvered, will also be worth trying. In this connection, it may be mentioned that the vibratory theory of light is being challenged, and a revision of explanations of optical phenomena may soon be in order.

There is another aspect of the subject generally overlooked, namely, that

the phenomena, as observed are those of visible light. If the usually accepted theory is applied, namely, that the effect is due to slowing down of the vibrations of the light falling upon the substance, it seems not improbable that similar retardations may occur without affecting the rays that are invisible, that is, a given substance may change the color of the light falling upon it, but not bring any otherwise invisible light into the range of human vision. It seems also possible that substances exist that increase the rapidity of the rays falling on them, thus acting in a direction opposite to fluorescence.

TONING BROMIDES

THAT excellent product, known as bromide paper, by skillful manipulation, yields a beautiful velvety black image by development, which only experts can distinguish from platinum work. The present high price of platinum paper makes its employment almost prohibitive. Bromide paper, therefore, has become the preferred medium for positive pictures, but the original tone had by ordinary development, despite its initial beauty, is, as a rule, discounted by pictorialists for what are denominated "warmer" tones, as if "black" were not capable of furnishing such.

To be sure, we do not want you to imply that we discount these warm tones in other color than black, but that too often the preferred tones really are not warm at all and more likely unpleasing in color, more so, indeed, than the initial color worked upon, leading one to the conclusion that the change in color had been effected for the purpose of amelioration, not from original intentions.

We have been induced, from this consideration, to select from the many formulas for toning "bromides", those processes which give a genuine tone, possessed of brilliancy, comparable with rich black and white—such as a pictorialist might desire to operate with upon an initially first-class bromide, developed to give a rich image in black color, and not for the purpose of trying to disguise a poor print in a garment of another color, in hope of improvement by a camouflage.

But little sifting has been done in the way, much to the distraction of the beginner. There are formulas galore, for brown and sepia, the generally elected tones; but a good many of them should have been relegated to oblivion to feed decay, long ago, not only on account of their uselessness scientifically, but also by reason of the hostile influence upon the print itself. Toning is essentially a chemical process and so must be treated in a chemical way, to insure successful issue.

The image worked upon is either metallic silver, in a fine state of division, so fine that it looks black, or a sub-salt of silver bromide. The toning either effects some molecular change in the bromide, by which it reflects the light differently, causing color change, or it produces a compound salt of silver with some other metal.

There are two methods of effecting the change, directly and indirectly. In the direct method, the change is had by a single application of some chemical body. In the indirect method, the print is subjected to two or more separate reagents. The application of the preliminary reagent produces a certain effect, which allows of a precipitation on the image by the application of the second body.

Now, you will appreciate from this, the necessity of having nothing in the constitution of the image but silver for the first reagent to have its innings upon, which practically means thorough elimination of that useful but dangerous agent, hypo. In other words, wash thoroughly the bromide before toning is attempted. And we might add, be assured too, that the bromide has, after development, been thoroughly fixed, for the same reason, of the presence of foreign bodies produced by chemical reaction between the silver and the products of hypo decomposition in the film of the bromide.

Of the two, preference is for the indirect method, because it is hard to determine whether the action has been perfect or whether something may not be formed, which afterwards may be acted upon by the light or atmospheric influence, hurtful to the tone and antagonistic to the permanency of the print. But in most of the indirect methods, we know that stability is effected from the color of the deposit formed, color of tone, because we know that character of combinations from its color is a stable salt.

The stronger the image in the original, the greater amount of silver deposit, and consequently the deeper will be the tone, and conversely a weak, original image can give only a weak tone, so a bromide, flat from over-exposure, comes out flat in the toned image. However, in all toned pictures there is a reduction of contrasts which is the result of optical presentation, because black and white make the greatest contrast to the vision.

Our remarks on toning are here confined to bromide prints—not to gaslight papers. You cannot get the same strength of tone with gaslight prints as with bromide proper, and with some tones the results are not pleasing.

Among the indirect methods let us first consider the so-called sulphide process. Here the preliminary action on the bromide is in the conversion into one of the haloid salts by employment of some bromide, iodide or chloride salt in association with ferricyanide.

The following is the most effectual formula:

Potassium ferricyanide	10 gr.
Potassium bromide	10 gr.
Water	1 oz.

Silver ferricyanide is first formed and subsequently silver bromide. The print in this bath bleaches out right rapidly or to its limit (the image does not always entirely disappear). It is now thoroughly washed, not less than five minutes for thin varieties of paper, and twenty minutes for heavy grades. Use running water for the purpose.

A five per cent. solution of potassium citrate may be used for the first wash with advantage. Let the bleached print lie in the solution for a minute before placing the tray under the tap for the washing.

The print is now ready for the sulphurizing. Sodium sulphide has been recommended, because it is less malodorous than the other sulphides, but this virtue (?) is outbalanced by the danger of encountering ugly, irregular patches over the print, caused by the easy decomposition of the sodium sulphide in contact with air. But all sulphides are like whiskey samples, differing only in one being worse than the other; and so "safety first" urges the use of the potassium or ammonium sulphide in preference.

If potassium sulphide is used, take 15 grains to ounce of water.

The toning should be continued a full minute after the operation seems complete so that the under layers of the film may be acted upon. A final good washing is demanded. This method gives rich brown tones inclined to sepia.

The following modification gives more decided sepia tones:

Potassium ferricyanide	10 gr.
Ammonia carbonate	20 gr.
Water	5 oz.

The bleaching here is not carried to the limit, so that when placed in the sulphurizing bath, an image of more intensity than that had by the above method, and of a more decided sepia tone results. Wash well, and all is well.

GETTING NATURAL BALANCE

WHAT is called artistic balance in a picture means the management of the various elements of the composition so as to effect a sort of bilateral symmetry; not a mere equilibrium, as in an evenly divided thing, like the balance pans of a scale, for instance.

This balance is had in a landscape by contrast of two principal masses, one larger than the other; the greater interest being centered in the smaller mass, some link being used to connect or associate these masses.

A definition of balance in landscape, as an art asset, is thus easily disposed of by use of words, but balance, as applied to portraiture, cannot be as easily explained by linguistic effort. But as this feature so essential to good portraiture is of seldom occurrence in figure photography, some attempt must be made to convey what is meant by it.

Perhaps it would be more illuminating if we call it "natural balance" or mastery of the powers of motion to expression of a sentiment. But even this generalization needs more concrete explanation. We all have a fair idea what is indicated as the pose of the subject; but, however skilful the artist may be in the management of the lines of the subject, disposition of drapery, etc., all which goes to make up a pleasing presentation of the model, unless

this be accompanied by a show of consistent motion and gesture and a due equipoise of the figure, whatever passion or meaning may be conveyed by the expression of the face is contradicted or nullified. Therefore, to preserve, in every case, this requisite balance and to represent with truth and character the relative degree of muscular activity to each and all the parts is the test of the artist's skill and becomes as much the instrument of expression as the real expression portrayed in the face. Without it, the best conceived pose and the best illuminated subject lacks what we may call vitality.

The subject suggests a sudden petrifaction, as if it had been caught at an instant—arrested movement—without suggesting the idea of progression or continuation of vital activity.

How many such presentations like this do we not see, excelling in all other points, but the absence of a show of this natural equipoise or balance makes one feel that something is wanting to indicate that the original is an animated thing, full of energy, thought and feeling. But turn and look at a portrait by Titian, say, where there is this natural balance, and we feel that it tells us of a living soul.

Yes, the photographer copies such a pose and thinks he has caught from it all that Titian has put in it, but his copy is a mechanical, lifeless thing, because he has failed to see the spirit which animates it. It is a copy, not an imitation.

It has been well said that it is this evident unity of purpose, the accordance of every part of the body with what the features express, which gives the vital and captivating effect to the pictures by Raphael, and the same enabled Michaelangelo to delineate with such beauty and truth every variety of activity with an energy and feeling peculiarly his own.

This accordance presupposes ability on the part of the photo-artist to call forth the mental attitude of the subject or to embody some particular motive. There is, to be sure, some risk of getting too much action, by the photographer transcending his prerogative and recording the theatrical or the sensational, but the risk is worth running, and there is so little evidence of "activity in repose" in portraiture, the whole attention being centered on the countenance, to the neglect of observing what part the body is playing in the motive.

Natural balance may be seen in the exquisitely delicate flexions of the head, upon the neck, in the flowing lines of the arms, the rising or falling, advancing or retiring of the shoulders, in the facility with which the torso turns on the hips, and the muscular activity which calls forth the smooth and gradual changes, preserving the equilibrium of the whole figure.

To the photographer, natural balance is associated in practice with the draped figure, and here a study of sculpture is invaluable. The sculptors furnish fine examples of almost all kinds of draperies in disposal, some large and ample in fold, some exceedingly tenuous. These give us an insight into the principles on which drapery should be adjusted which may be made applicable to the exigencies incident upon modern styles of costume.

(CONTINUED)

Materia Photographica

A Dictionary of the Chemicals and Raw Materials of Photography.

Part I—General Materials.

Part II—Dyes and Developing Agents.

BY

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ALUM-AMMONIA,
$Al_2(SO_4)_3(NH_4)_2SO_4.24H_2O$

Fr. Al n d'Ammoniaque. Ger. Ammoniakalaun
Syn. Aluminum-Ammonium sulphate.
M. W. 906: Sp. G. 1.645: M. P. 94.5° C.:
Sol. in water: Ins. in alcohol.
P. Colorless crystals.
Der. Obtained by crystallization from a mixture of aluminum and ammo ium sulphates. Purified by recrystallization.
G. U. S. P. (Lump, ground or powdered).
A. P. Powdered, 40 cents per lb.; Granular, in bulk, 12 cents per lb.
U. P. Used in the preparation of acid fixing baths and sometimes as a hardener for gelatine.

ALUM CHROME, $K_2SO_4Cr_2(SO_4)_3.24H_2O$

Fr. Alun de Chrome. Ger. Chromalaun
Syn. Chromium and potassium sulphate.
M. W. 916.
Sol. in water: Ins. in alcohol and ether.
P. Violet colored crystals yielding a dichroic solution.
Der. Obtained as a by-product in the manufacture of alizarine and several other dyes.
G. Technical, crystal or powdered.
A. P. 33 cents per pound.
U. P. Chrome alum is in general use as a hardner for photographic emulsions, the addition being made previous to coating. It is also used in the preparation of the chrome alum fixing bath. In process work, chrome alum is used as a hardening agent for gelatine and fish glue, and is used as an addition to the nitric acid bath for etching enamel images on zinc with a view to preventing the image from becoming soft.

ALUM, IRON, AMMONIA
$FeNH_4(SO_4)_2.12H_2O$

Fr. Alum de fer. Ger. Ammoniakeisenalaun
Syn. Ammonio-ferric-sulphate, Iron ammonia sulphate.
M. W. 962.
Sol. in water: Ins. in alcohol.
P. Lilac or violet efflorescent crystals.
Der. Solutions of ferric sulphate and ammonium sulphate are mixed, then evaporated and crystallized, purified by recrystallization.
G. U. S. P.
A. P. 42 cents per pound.
U. P. Has been recommended for use in fixing baths, but is not satisfactory. Principal use in photography is in the making of ferric oxalate.

ALUM POTASH, $Al_2(SO_4)_3K_2SO_4.24H_2O$

Fr. Alun de potasse. Ger. Kalialaun
Syn. Aluminum and potassium sulphate.

M. W. 948: Sp. G. 1.7571: M. P. 105° C.
Sol. in water: Ins. in alcohol.
P. White crystals.
Der. By roasting alunite in special furnaces, afterwards leaching the mass and recovering the salt by crystallization.
G. U. S. P.
A. P. 12 cents per pound.
U. P. Used in the preparation of hardening solutions for fixing baths. One of the ingredients of the hypo alum toning bath. Can be used as a clearing bath. In process work used in conjunction with dilute nitric acid for matting surface of zinc plates previous to coating with bicromated albumen. Is sometimes used for hardening photographic emulsions, but is not so suitable as chrome alum.

ALUMINUM, Al

Fr. and Ger. Aluminium
A. W. 27: Sp. G. 2.708: M. P. 657° C.
Sol. in acids and alkalies: Ins. in water.
P. Silvery ductile metal.
Der. Obtained by electrolysis of the oxide in a bath of molten cryolite.
G. Sheet and dust.
A. P. Aluminum sheet, $1.00 per pound. Aluminum powder, $1.26 per pound.
U. P. Frequently used as one of the ingredients in flash light powders. Very largely used for the construction of light hand cameras and for lens fittings. Used for the screen and plate-holders of process cameras, as it is not easily acted upon by silver nitrate solutions. Aluminum is now used as a substitute for the lithographic stone.

ALUMINUM CHLORIDE, $Al_2Cl_6.12H_2O$

Fr. Chorure d'Alumine. Ger. Chloraluminium
M. W. 483: M. P. 190° C.
Sol. in water, ether and alcohol.
P. Yellowish white crystalline or granular powder, very deliquescent.
Der. Chlorine gas is passed over alumina in a heated tower, the product being recovered by sublimation.
G. Technical (must be kept in well stoppered bottles.)
A. P. 60 cents per pound.
U. P. Used in the gold and platinum toning baths. Has been recommended for hardening gelatine emulsions, but is not satisfactory.

ALUMINUM SULPHATE, $Al_2(SO_4)3.18H_2O$

Fr. Sulfate d'alumine. Ger. Aluminiumsulfat
Of very little importance in photography. This material is often erroneously called alum.

ALUMINUM SULPHOCYANIDE, Al $(CNS)_3$

Fr. Sulfocyanure d'alumine. Ger. Aluminum-rhodanid
Syn. Aluminum sulphocyanate, aluminum rhodanide.
M. W. 402.
Sol. In water: Ins. in alcohol and ether.
P. Yellowish powder, extremely deliquescent.
Der. Aluminum cyanide is boiled with sulphur, the product being purified by crystallization.
G. C. P. (must be kept in well stoppered bottles).
A. P. Constantly fluctuating.
U. P. Used as a preliminary bath for self-toning papers. Has been recommended in connection with gold toning bath, but is unsatisfactory.

AMMONIA WATER, NH_4OH

Fr. Ammonique. Ger. Ammoniakwasser
Syn. Ammonium hydrate, ammonium hydroxide.
Sp. G. (28%) .897: B. P. 38.5° C.
Sol. In water.
P. Colorless liquid with extremely irritating fumes. Should be kept in a cold place in well stoppered bottles.
Der. Gas liquor from coke and gas manufacture is distilled, the volatile salts and ammonia being absorbed in sulphuric acid. This yields ammonium sulphate, which is heated, the ammonia distilled off and collected in water. Also made from waste animal matter.
G. U. S. P. 28%.
A. P. 40 cents per pound.
U. P. Used as an accelerator in pyro developer. Also for blackening the mercury bleached image in intensification. Is used as an addition to the bichromate bath for sensitizing carbon tissue. Ammonia is used in emulsion making in the ammonia

nitrate process in order to produce exceedingly rapid emulsions. In process work is used as an addition to the bichromated albumen solution and also the fish glue solutions.

AMMONIUM BICHROMATE $(NH_4)_2Cr_2O_7$

Fr. Bichromate d'Ammoniaque
Ger. Ammoniumdichromat

M. W. 252: Sp. G. 2.153.
Sol. in water and alcohol.
P. Yellow needles, explodes when in contact with many substances.
Der. Chromic acid acting on ammonium hydroxide followed by crystallization.
G. C. P.
A. P. $1.07 per pound.
U. P. Sometimes used for sensitizing carbon tissue, Gum bichromate, and in various photo-mechanical processes. Has greater sensitizing power than the potassium salt and in the carbon processes gives stronger pictures. In process work is used as a sensitizer for fish glue for printing half tone images on copper and zinc. Ammonium bichromate is about twice as sensitive to light as is potassium bichromate.

AMMONIUM BROMIDE, NH_4Br.

Fr. Bromure d'ammonium. Ger. Bromammonium
M. W. 98: Sp. G. 2.327.
Sol. in water, alcohol and ether.
P. Colorless crystals.
Der. Hydrobromic acid acting on ammonium hydroxide followd by crystallization.
G. U. S. P. granular.
A. P. 55 cents per pound.
U. P. Can be used as a restrainer in place of the potassium salt, but must not be used with the caustic alkalies or carbonates, as ammonia would be set free. Largely used in emulsion-making, producing an emulsion with a little higher contrast than one made with potassium salt.

AMMONIUM CARBONATE $(NH_4)HCO_3+(NH_4)(NH_2)CO_2$

Fr. Carbonate d'ammoniaque. Ger. Ammoniumkarbonat
Syn. Hartshorn, rock ammonia.
M. W. 157: M. P. 85° C.
Sol. in water, decomposes in hot water.
P. Colorless crystal plates, unstable in air, rapidly becoming converted to the bicarbonate.
Der. Ammonium hydroxide heated with ammonium bicarbonate.
G. U. S. P. (cubes or powder).
A. P. Cubes 48 cents per pound. Powder 41 cents per pound.
U. P. Can be used to replace ammonia water in some developing solutions, but must not be dissolved in hot water. Is frequently used to replace ammonia in the ammonia nitrate processes of emulsion making.

AMMONIUM CHLORIDE, NH_4Cl

Fr. Chlorure d'Ammoniaque. Ger. Chlorammonium
Syn. Sal ammoniac.
M. W. 53.5: Sp. G. 1.520.
Sol. In water, alcohol and ammonium hydroxide.
P. White crystals.
Der. Ammonia salts acting on hydrochloric acid followed by crystallization.
G. U. S. P. granular.
A. P. 33 cents per pound.
U. P. Used in the salting of albumenized paper, its principal use, however, being in the preparation of chloride emulsions.

AMMONIUM CITRATE $(NH_4)_3C_6H_5O_7$

Fr. Citrate d'ammoniaque. Ger. Ammoniumcitrate

Very little used in photography. Occasionally used as restrainer with pyro developer.

AMMONIUM FLUORIDE, NHF

Fr. Fluorure d'ammonium. Ger. Fluorammon

Very little used in photography, occasionally used for stripping negatives. Must be kept in wax-lined bottles.

AMMONIUM HYPOSULPHITE, $(NH_4)_2S_2O_3$

Fr. Hyposulphite d'ammoniaque. Ger. Ammonthiosulfat

Syn. Ammonium thiosulphate.

Very little used in photography. In the earlier days was recommended as a substitute for the sodium salt.

AMMONIUM IODIDE, NHI

Fr. Iodure d'ammonium. Ger. Iodammon
M. W. 145: Sp. G. 2,501.
Sol. In water and alcohol.
P. White crystals.
Der. Action of ammonium hydroxide on hydroidic acid, followed by crystallization.
G. U. S. P. granular.
A. P. $6.50 per pound.
U. P. Is used in making iodized collodion and has been recommended for negative emulsions. It is unsatisfactory for fast gelatino-bromide emulsions because it is unstable and readily gives off iodine.

AMMONIUM MOLYBDATE $(NH_4)_6Mo_7O_{24}4H_2O$

Fr. Molybdate d'ammoniaque. Ger. Molybdansaures ammonium
M. W. 1236: Sp. G. 2.38–2.95.
Sol. In water and acids.
P. White crystalline powder readily decomposed by heat.
Der. By the reaction of a solution of molybdic acid and ammonium hydroxide followed by crystallization.
G. U. S. P. crystals.
A. P. $3.75 per pound.
U. P. Used as an ingredient in P. O. P. emulsions to give greater contrast; has also been recommended as an addition to chloride and bromide emulsions to increase contrast and blacks.

AMMONIUM NITRATE NH_4NO_3

Fr. Azotate d'ammonium. Ger. Salpetersaures ammon
M. W. 80: Sp. G. 1.725: M. P. 153. Decomposes at 210° C.
Sol. In water, alcohol and alkalies.
P. Colorless crystals, explosive.
Der. By the action of ammonium hydroxide on nitric acid.
G. U. S. P. granular.
A. P. 35 cents per pound.
U. P. Sometimes used as a substitute for the potassium salt in flash-light mixtures; is one of the salts formed in emulsion-making by the double decompositon of ammonium bromide and silver nitrate.

AMMONIUM OXALATE, $(NH_4)_2C_2O_4H_2O$

Fr. Oxalate d'ammoniaque. Ger. Ammonoxalat

Very little used in photography; finds occasional use in the preparation of ferric ammonio-oxalate.

AMMONIUM PERSULPHATE $(NH_4)_2S_2O_8$

Fr. Persulfate d'ammoniaque. Ger. Ueberschwefelsaures Ammonium
M. W. 228.
Sol. In water.
P. White crystals.
Der. By the electrolysis of a concentrated solution of ammonium sulphate followed by crystallization.
G. C. P. crystals.
A. P. Constantly fluctuating.
U. P. Its principal use is as a reducer, its valuable property being that it reduces the high-light detail more than the shadows. Has been suggested as a hypo eliminator. Sometimes used to remove developer stains and as an addition to the oxalate developer for platinotypes. Such an addition improves the quality of over-exposed platinotype prints.

AMMONIUM PHOSPHATE $(NH_4)_2HPO_4$

Fr. Phosphate d'ammonium. Ger. Ammonphosphat
Syn. Ammonium diphosphate, Diammonium ortho-phosphate.
M. W. 132: Sp. G. 1.619.
Sol. In water: Ins. in alcohol.
P. White crystals.
Der. Reaction of ammonium hydroxide and phosphoric acid, followed by crystallization.
G. C. P. granular.
A. P. $1.20 per pound.
U. P. Frequently used for fire-proofing fabrics for use around the studio and work-rooms, and used in making the slow silver phosphate emulsions.

(To be continued)

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Memorial Photographic Exhibition

An exhibition of photographic art and practice as developed between 1840 and 1871 has been opened in Frankfurt on the Main. The final date is that of the introduction of the dry plate, so that the exhibition will be practically limited to the Daguerreotype and wet plate, excluding reproductions and negatives. Notwithstanding these limitations, over 500 exhibits have been presented, including a great variety of themes. Landscape views are few in number, as might be expected on account of the long exposure and preliminary work required for the Daguerreotype and the need of a portable dark-room for the wet plate. The earlier positives were made on plain paper, salted; later, albumen and other coated papers were used. The oldest Daguerreotypes bear date from 1842; the earliest paper prints from 1845. An exhibition of this kind has a secondary interest, namely, as showing the changing in the fashions in studio work. The majority of the paper positives shown are of the "carte de visits" type. This form will be well recollected by elderly photographers as popular during the Civil War, when almost every departing soldier was so pictured. Thousands of such must be still in existence in old albums, most of them now yellow from the action of the traces of hypo left in the paper.

It would be interesting to know how many examples of the once popular multiple pictures remain in family archives. The catalogues of the dealers in cameras showed forms with four objectives and arrangements for transverse and vertical motions by which sixteen pictures could be taken on one plate. Then there is the "tin type," with its paper envelope. Today is largely the domination of the postcard photo, and no one can tell what will be the next fad. We must not forget the "confrontation picture," that is, showing a person facing himself. Allusion has already been made several times lately in The Photographic Journal of America to the indications of a return of the popularity of the stereoscope. The managers of the photographic section of the Sesqui-centennial to be held in Philadelphia should see that an extensive exhibition is given of all photographic procedures and results since the beginning of the art and science of picture-making by light.

What Happens in the Toning

We thought when first asked this question, by an amateur of inquiring mind, that's an easy one, but when we started on our solution we were in doubt at once. Is toning a substitution process, or is it a sort of electro-chemical decomposition, or transferrence method, or are substitution and deposition both involved?

For more than a half century photographers have been using salts of various metals to change the color of positives with varying results—notably the salts of gold and platinum, but when the gelatine paper print was introduced it was found that the baths we used to employ in toning albumen prints did not give just the results, the delightful old-fashioned tones, and so we sought how to modify the baths to get what we wanted.

Sulphocyanide was resurrected from its long desuetude, and came up for a candidate. But it was noticed that unless certain precautions were observed there was tendency to double tones, and this undesirable feature could only be counteracted by additions of gold in quantity—not at all economical.

All substances which tend to reduce the noble metals are applicable to toning. Even a weak alkaline solution of ferrous sulphate in connection with the gold salt may be made to tone satisfactorily.

Every one is familiar with the reddish tone we get by putting the print directly in the hypo. This color remains, or rather turns to a more or less dingy foxy tint, but if we immerse a toned print in the hypo a darkening takes place after a time.

The action of reducing agents on gold is one of the reasons which makes us careful

to keep hypo out of our toning solutions, because it is so greedy of the gold, and prevents deposition on the image.

Now, again, why do we avoid acidity of the toning bath? Simply because it acts as a restrainer and hinders deposition, giving the red variety of subchloride.

Long before photographers ever thought of "toning," about 1824, Faraday made some remarkable experiments about molecular structure of excessively thin films of the metals. He showed how the molecular structure affected transmitted light and gave various colors, according to the peculiar aggregation of the molecules.

Now this action of gold in tenuous films may be what really takes place in toning. According to the way the metal is thrown down we have variation of color of the image of the silver, as seen through the diaphanous film of gold.

In the reduction of gold chloride we have formed hydrochloric acid and gold teroxide —by decomposition. This teroxide is very easily decomposed, and, no doubt, it takes place in the decomposition during the actual deposit of the gold upon the silver.

To neutralize the effects of the free hydrochloric acid we add an alkali—a soluble chloride is formed and carbonic acid—so then the chlorine liberated from the gold chloride attacks the reduced silver in the print, and while the gold is depositing, it is all the while converting the subchloride back to its chloride state, but if there is an excess of the unreduced silver the retarded gold cannot make a good showing, and the color is what we call poor, and so we add some body which has a greater attraction for the chlorine liberated from the gold chlorine than the silver chloride has, and so we enrich the color of the image.

A Word About Color Photography

We hear a good deal of argument about the character of the modern scheme of translating by photography the colors of Nature. Many aver that the solution of the problem is by no means reached, and that the colors are only a result of skillful application of artificial pigments and not the actual translation of the tones and tints of Nature.

Well, if we look at it this way, we may reasonably conclude that the reproduction of Nature will never be accomplished by photography. Photography is an art, and as an art must use, like the painter does, artificial means to convey truth. We do not object to the painting because the pigments are chemical substances. Why demand of the photographer what is only possible by process of physical reflection, say, in a mirror? There can be no permanent record of Nature but by some method of approximation—by artificial means.

Color cannot be got by any method inherent in photography itself. We might possibly some day discover a means of transmission of the actual in Nature, so as to molecularly impress it in all its beauty: but the question is, could such a rendering be made permanent as a photograph?

When ordinary light is analyzed by the spectroscope, it is found to consist of a mixture of different kinds of light, which, falling upon the retina, produce various vibratory sensations, giving rise to what we call color perception.

Even the physiological explanation of this wonderful phenomenon is not entirely satisfactory, despite the labors of Helmholz and others. The notion about the cones and columns in the retinal structure is mere guesswork, never experimentally proved. There seems some truth, however, about the change in visual purple substances, which reminds us of photogenic action like our processes in photography. The eye may make a color photograph for the mind, but it has no means to fix it, or, fortunately, it finds it would not do to fix it.

Further, we know that if an object does not equally reflect all different kinds of light of which the white light is composed, the reflected light, falling upon the retina, will be more or less wanting in some of the constituents which produce the sensation of color; so that a colored object is one which does not equally reflect all the elements of white light, but absorbs some. The light absorbed, we are told, is converted into heat. Now, how can we expect any artificial, sensitive surface to possess structural or molecular quality to discriminate in appropriation of the various colors just where they are needed?

We must premise a body having selective ability in entirety with molecular structure of every variety. If we analyze the light reflected by any colored object or transmitted by a colored screen, we shall find that the continuous spectrum which is obtained with white light is replaced by one from which a portion is partly or completely missing. This missing portion appears as a black band, known as an

absorption band, of that color. If a particular object absorbs most of the elemental colors, so that only a small portion of the spectrum is reflected, that portion may be referred to as the reflection or transmission band.

Since the light which is not absorbed falls upon the eye, the sensation of color produced is the reverse or complementary to the color which is absorbed. When white light is spectroscopically examined, there is shown a band of colors consisting of three main portions—red, green and blue-violet, the red passing into the green through gradations of orange and yellow, and the green into violet through gradations of blue-green and blue. So sensations of various colors are the result of certain mixtures.

But perhaps we have said enough to show what the experimenter after direct color reproduction is up against, and, considering the complexity of the problem, we may reasonably conclude that much more patient investigation is demanded in physics and chemistry before we may hope to be able to get a film which shall perform the function of the eye, and, besides, a plan for arresting the action at any desired moment.

Influence of Temperature During Exposure

An inquiry was recently made whether temperature of the plate, at the time of exposure, had any influence upon the character of the image. Sir William Abney, about thirty-five years ago, undertook some experiments in this direction.

When a warm iron plate is pressed against the back of a plate and the plate then be examined by reflected light, the color of the film is changed to an orange tint, but on cooling, the original color of the film is restored.

Place an iodide of silver plate in an atmosphere of intense cold, such as may be had by carbonic acid, snow and ether, and the film turns decidedly grey. An evident change is manifestly produced and in fact the plate warmed at back, if so exposed, yields on development a very dense image; and if the illumination be feeble (light from a match), the parts not affected in the plate by the heat (outside the iron), are hardly touched by development. This happens whether the plate be developed while still hot or after it has cooled.

The Sulphites

There seems to be considerable widespread inaccuracy concerning the sulphites used in photography. Sulphurous acid is a dibasic acid containing two atoms of sodium or potassium or some other metallic element.

We have thus the ordinary sodium sulphite and the ordinary potassium sulphite. Now, if only one-half the quantity of potassium or sodium is used and only one-half the hydrogen is displaced, it is natural to expect that we would get the compounds represented by $NaHSO_3$ and $KHSO_3$, or sodium and potassium bisulphites, or acid sulphites of these metals.

Although we see in many formulae for developers mention made of sodium bisulphite and potassium bisulphite, it is doubtful whether such salts really are ever had in a state of purity. Chemists have made numerous efforts to prepare these salts in a state of isolation, but their experiments have not conclusively proved the possibility, because as soon as they are nascently formed in the reaction they speedily change. Water is eliminated from the bisulphite and another combination results. The compounds represented by $Na_2S_2O_5$ and $K_2S_2O_5$ are called anhydro-sulphites or meta-bisulphites.

Of course, you may buy what is called sodium or potassium bisulphite from the chemist, but it is not really a sulphite, but only an impure meta-bisulphite containing a sulphate. This latter body is not very desirable as an associate with the other constituents of your developer.

There are on the market, however, pure normal sodium sulphite, sodium meta-bisulphite and potassium meta-bisulphite. The pure sodium sulphite may be had anhydrous or crystallized, and is a very good product and practically pure, at least containing nothing hurtful in photographic practice.

The small percentage of sodium carbonate in it makes it decidedly alkaline. The presence of this carbonate requires some free sulphurous acid to neutralize the solution, which is the reason the acid is recommended in compounding the developer.

Sodium and potassium meta-bisulphite come in the market in the shape of well-defined crystals—the larger the crystals the more likely the insurance of the purity of the salt. The potassium salt crystallizes more readily than the sodium salt, and is generally accounted purer. Both salts keep

well and readily dissolve, and are excellent for the developer. Their solutions are strongly acid, so that it is unnecessary to add acid, as in the case of the normal sulphites, for the preservation of the developer.

It is well to bear in mind, however, that in using the meta-bisulphites one part of the meta-bisulphite is equivalent to nearly three parts of the ordinary sulphite. Another thing to remember in their use is the fact of their strong acidity, because the acid will neutralize part of the alkali used in making up the developer, and if allowance is not made for this behavior one might think the meta-bishulphite acted as a retarding agent. You should therefore take into account this fact when making up your developing fluid, so as to get the proper quantity of alkali in the formula.

Color Cinematography

The *British Journal of Photography*, in its issue of June 2, gives an account of the process of color cinematography announced by Mr. Aron Hamburger, who has been devoting himself to this field for some years. Color cinematography, at present, is attracting the greater portion of the efforts of those studying color photography. The commercial demand is, of course, for a film that can be shown with the same facility as the ordinary monochromatic form, a problem that involves both the ingenuity of the inventor and the skill of the manufacturer. The complexity of the problem is increased as the number of color screens increase, and hence, efforts are constantly being made to accomplish satisfactory results with two colors instead of three. Much has already been accomplished and as, fortunately, most audiences are not very critical, the simpler forms have been shown with some success. Nevertheless, it is desirable that the colors should be natural and should have wide range, which can not be expected of the two color system under ordinary conditions. It is also desirable that the colors should be pleasing, and that the films should be readily producible on an industrial scale.

Exhibition was given in England lately of the Hamburger film, the preliminary method being as follows: Two films are exposed at once in the taking camera, one to record the red and yellow and the other the green and blue-violet. The particular novelty of the invention does not, however, apply to this phase of the work, although some improvement in details has been made, but the important improvement is the production of a film ready to be exhibited. This is accomplished by a system of simultaneous selective dyeing and mordanting, that is, four colors are fixed at one operation. The procedure seems to be very simple and capable of general application in commercial work. The general method is as follows: Printing is done on a positive film coated on both sides, negatives from one color sensation being applied on one side and those of the other color sensation in careful register to the other side. This double (monochrome) film is developed, fixed, washed and then treated in a machine by which the sides are respectively coated with a mixture of red and yellow dyes on one and a mixture green and blue-violet on the other. The basis of the method is the discovery of a definite chemical reaction which takes place between the dyes used and the silver image, a selective action being obtained by the use of certain reagents. The dyes that are applicable to such a purpose are, as might be expected, limited in number, but it is stated that the whole range of the visible spectrum has been covered. The dyeing is not actually completed by the machine, for the film has been simply coated. The film must be further treated, which is done by immersion in a bath, which converts the silver image into a receptive condition and mordants the dyes firmly. At this stage the pictures are masked by the excess of dye, but a special process of washing is employed. In a given series of pictures, for instance, those that have been taken in the red and yellow combination, the washing results in a regular gradation from red to yellow in the image, corresponding to the density of the silver deposit, that is, the shadows of the picture are dark red, while the high-lights are yellow, but the dyes are completely washed out in the non-silvered portion. On the other side of the film the process results in blue in the shadows and green in the high-lights. After these effects are obtained, the dyes are mordanted so as to fix them firmly and the silver is removed, leaving a pure and transparent color-quadruplex.

Favorable comment on the process was made by those who saw the exhibition, and it seems that the procedures are not difficult of execution. The process is applicable to ordinary color photography, for prints or transparencies.

The Autochrom Portrait

Among the subjects that may be taken up by workers with autochroms is one that has been but little discussed, because few have been interested in it, and even these few have not had success in all cases. Reference is made to autochrom portraits. We are, of course, not unaware of the principal difficulty, namely, the rather long exposure, but this need not, in itself, be a complete prohibition. Exposure is, indeed, a fundamental difficulty in all photographic work. Portraits may be classified in two groups: those made in the studio and those made in the open. The former is not available to all, but the open air is free, and affords opportunities even to those who are not equipped with the highest type of apparatus. For portraiture in the studio, a lens of high illumination is needed, but the reader must not exaggerate this requirement. Good autochrom portraits (about 3.5 x 5.5) have been made in stereoscopic cameras with lenses working at *f*6.8, but this was in exceptional conditions of light (June), the subjects were well trained and kept still for about three-quarters of a minute, an ability truly not of common occurrence. The studio was so arranged that the glass roof faced the north, with glass above and on the side, the panes being unground, but crackled. The curtains were not closed and the exposure was made as brief as possible.

The diaphragm opening just noted is extreme, and the amateur should have a lens working an *f*4.5. If depth of field is not required—a condition that will complicate matters a good deal—an opening even larger say *f*3.5 is advisable. A lack of depth of field is not insurmountable; excellent pictures have been made at the larger opening. With such large openings, of course, the time of exposure may be much reduced. The objection to the long exposure may be materially diminished by choosing poses that are comfortable, and that the models can hold without serious stress; seated, for instance, at a table with elbows resting thereon, or reclining on a lounge. The model should also be told that winking is allowable, as usual—that is, not to attempt to hold the eyes continually open, although they should not be allowed to droop. The eyes should be kept in one direction, as far as possible, but a momentary departure does not affect the result in the prolonged exposure. The permission to allow the eyes some motion has a favorable effect on the model, relieving strain, and eliminating the fixed, stressed look that is so objectionable, which often results in ordinary studio work, in spite of the "look pleasant, please," of the photographer.

Backgrounds must be carefully chosen for this work. Neutral tints and faded materials are unsuitable. A somewhat dark red or green velvet may be used, which may show some folds, as these give a pleasing play of light. The fantastic backgrounds must be used with care, as they are apt to take away the interest from the figure. The tint of the background must be adapted to the tints of the toilet. When the model is brilliantly dressed, the background should be subdued, but if the dress is dull in color, the background should be somewhat brilliant, but the artist must use much discretion in these matters and not be misled into the thought that it is "color photography" alone which is being carried out. As with ordinary work, the illumination of the model may be modified by the curtains, but care should be taken to avoid severe contrasts, by the introduction of very strong light, or by the use of highly illuminating objectives. The larger the opening of the diaphragm, the more the shadows are brought out, and one can obtain by a pose of 1 second the same range of values at *f*8 as will be given by *f*4 with the exposure of a quarter of a second. In the autochrom, however, the light is especially enfeebled by the tricolor screen; for this reason the plate has a tendency to exaggerate certain contrasts, which makes it necessary to give a somewhat prolonged exposure when the colors are strongly contrasted in the object and to cut short the first development. Moreover, the exposure being somewhat prolonged in the studio, the model should not be further vexed by too powerful illumination. By avoiding interference with unnecessarily brilliant colors, the autochrom will give satisfaction in so far as rendering properly the eyes, the hair and the skin. As with the ordinary monochrom (perhaps really more with that), autochrom portraiture is more difficult with blondes than with brunettes, in part because their flesh tint is more active in reflection. We must, therefore, give more attention to the environment of color, in portrait work than in other lines, and examine carefully what reflections may occur from the hair, especially if silky, or complexions very smooth.

The light of the sky is itself a disturbing factor.

The color rendering of the autochrom is often more exact than that which the eye renders, yet even it modifies somewhat the object. Objects are, moreover, modified to our eyes by the environment. The autochrom may give a somewhat different rendition, and thus surprise us when a familiar scene or person is the subject. Autochrom work can, therefore, be carried on successfully indoors with many subjects, but it will be found that children and restless adults cannot hold still long enough. Under any circumstances, the model should be given as restful a position as possible, and the accessories must be chosen so as not to overload the picture. As above noted, with *f*4.5 the exposure in the studio will be about 30 to 45 seconds. Shorter periods may be secured by using strong artificial light or flash powders.—V. Crémier in *Photo-Revue*.

Desensitisers

The employment of desensitising bodies in development is engaging much attention and is being worked out in a practical way. The subject, however, is not new scientifically.

Investigation on the nature of the so-called latent image has called notice to the properties of oxydizing agents but solely in relation to the scientific aspect. But recently the introduction of phenosafranine has shown its practical value in photographic manipulation. It is another argument of the importance of an understanding on the part of the practical man of the nature of the processes he employs, a truth he is apt to ignore, in fact, what he will continue to ignore without appreciation of the services of the laboratory worker.

Over a year ago Dr. Lüppo Cramer gave the profession the results of his careful and long continued researches and put in its hands a means of development of highly sensitised plates in bright light. Since this time other like agents have been introduced by other experimenters possessed of like virtues of the phenosafranine, some of which are free of the staining action of the phenosafranine.

Attention is now directed to the discovery of a body or bodies of the eminent virtue of phenosafranine but without the attendant staining.

Hundreds of different dyes are being investigated. Foremost among the experimenters is the renowned chemist, Dr. Koenig, who collaborated with Dr. Lüppo Cramer in his original investigations. Dr. Koenig presents a new class of products as efficient as phenosafranine as desensitisers, some of which are devoid of the drawback in staining the film or the fingers of the manipulator and which interfere in no wise with the usual operations of the photographer.

Raymond E. Crowther (*British Journal of Photography*, June 16) has called attention to the fact that, with certain developers, phenosafranine exerts a pronounced retarding action while with hydroquinone the characteristic pause between pouring on the developer and the appearance of the image vanishes—in fact, hydroquinone as a developer, either after a preliminary desensitising bath of phenosafranine, or a mixed developer containing phenosafranine, behaves exactly like metol.

Mr. Crowther, by the courtesy of Dr. Koenig, tested the two products considered at present the best, called by their discoverer "Pinakryptol" and "Pinakryptol-Green," the latter being a pure green non-staining color body, with no affinity for gelatine or the human cuticle. The results warrant publication, indicating how near to the ideal body research is bringing us.

PINAKRYPTOL

This is a dark greenish-grey powder, the larger proportion of which is only soluble with great difficulty even in 5,000 times its weight of warm water. As it does not appear possible to prepare a stronger solution than 1:5,000, one must either be able to weigh out exceedingly small quantities or deal with large volumes of solution. One would naturally choose the latter method of working, and so minimise the risk of spoiling sensitive material by reason of flying specks of the dry Pinakryptol. The 1:5,000 solution, which is of a turbid grey-green character, can be used either as a preliminary bath—immersing the plate or film therein for not less than one minute in the dark before proceeding to development in a full red or orange light (or by candle light)—or 25 per cent. by volume of the Pinakryptol solution may be added to the usual developing solution, and the first 1½ to 2 minutes of the developing operation be conducted in a "safe" light.

Desensitising Efficiency.—Mr. Crowther has only tested this desensitiser according to the former method so far, and has found that the reduction of sensitiveness with a superspeed portrait film is of the

order of 1/1,100; it is, therefore, of somewhere about the same efficiency as phenosafranine. Experiments with a panchromatic emulsion indicate that the Pinakryptol is at least 1½ times as efficient as phenosafranine in desensitising for the shorter wave-lengths (blue end of spectrum) and at least 2½ times as efficient as phenosafranine in desensitising for the red end of the spectrum.

Staining Tendency.—The almost complete lack of affinity between the small proportion of green substance which is present in Pinakryptol, and the entire absence of color from the constituent present in the larger proportion, lead to a finished negative, even on film base, which, after five minutes' washing in running water, is quite free from stain. A marked advantage over phenosafranine is thus evinced. It will be obvious also that Pinakryptol may find application in stand development, there being no objection to prolonged immersion in a bath containing this desensitiser.

Development Effects.—These can be most conveniently stated in a tabular form, and they will therefore be given, along with those evidenced by Pinakryptol Green, at the end of this communication. It is only necessary here to point out that a retardation of development is caused by densensitising with Pinakryptol.

PINAKRYPTOL GREEN

This product comes on to the market in small, granular crystals, which exhibit a green appearance by reflected light. It has the characteristic appearance of what are commonly termed "basic" dyes. It is fairly readily soluble in water, and a 1:500 stock solution of an intense green color can be conveniently made up and diluted 1:10 for use as required.

Desensitising Efficiency.—Used as a preliminary bath 1:5,000 for one minute on a Kodak super-speed portrait film, the sensitiveness was reduced 1/1,500, it is thus a more efficient general desensitiser than either phenosafranine or Pinakryptol. Like these products it may also be combined with the developer, in which case five to ten minims of the 1:500 solution should be added to every fluid ounce of the developing solution and the development conducted in a safe light during the first minute. The desensitising action of Pinakryptol Green on a panchromatic emulsion is of the same order as that of phenosafranine for blue light, whilst for green, yel low and red light the depression of sensitiveness is so great that no developable image was produced in the tests made by the writer by the action of lights sufficiently strong to give pronounced effects on a phenosafranine-bathed plate.

Staining Tendency.—The color of the 1:5,000 solution of this product is so intense a green that pronounced staining of the gelatine is naturally looked for; whereas, as a matter of fact, there appears to be no staining whatever, the only discoloration which is noticed when the film is removed from the developer is that due to the green solution soaked into the film. It is removed at least as readily as the fixing bath products; ten minutes' washing in running water being ample to give a colorless negative, even on N.C. film base, which is coated both back and front with gelatine. Moreover, dishes are quite unstained by the solution, which in the full red or orange light of the workroom can be most conveniently handled owing to its apparent black color.

Development Effects.—These will now be expressed in tabular form, including, for reference, the results obtained when a 1:5,000 bath of phenosafranine is used as a preliminary desensitising bath. All the tests were made on super-speed portrait film, the exposure to screened electric light being the same for each section of film, which was placed in contact with an Elder-Hecht Goldberg wedge photometer. The developers were used at a temperature of 65 deg. F., and the control film, which is designated as having been subjected to no desensitising bath, was immersed in water for the same time as the remaining films were immersed in the desensitising solutions previous to development.

Hydroquinone Developer.—

A.—Hydroquinone	....	1 oz.
Potass. metabisulphite	......	1 oz.
Potass. bromide	....	1 oz.
Water	.....................to	40 ozs.
B.—Caustic potash (sticks)	......	2 ozs.
Water	....	40 ozs.

Equal volumes A and B are mixed for use.

Desensitising Bath	Time of Appearance. Secs.	Total Time. Mins.	Total Time. Secs.	Watkins Factor.
None	30	3	0	6
1:5,000 Phenosafranine	2	2	0	60
1:5,000 Pinakryptol	12	2	36	13
1:5,000 Pinakryptol Green	2	2	0	60

[NOTES—The four results are practically identical in amount and contrast of image.]

Metol Hydroquinone Developer.—

Metol	15	grs.
Hydroquinone	60	grs.
Sodium sulphite (crystals)	1½	oz.
Sodium carbonate (crystals)	1½	oz.
Potass. bromide	4	grs.
Water	to 40	ozs.

Desensitising Bath	Time of Appearance. Secs.	Total Time. Mins.	Secs.	Watkins Factor.
a None	20	4	0	12
b 1:5,000 Phenosafranine	20	4	0	12
b 1:5,000 Pinakryptol	60	4	30	4½
a 1:5,000 Pinakryptol Green	20	4	0	12

[Notes—*a* Normal contrast; *b* Slightly weak.]

Pyro Developer.—

A.—Sodium sulphite (cryst)	16	ozs.
Sodium carbonate (cryst)	16	ozs.
Water	to 80	ozs.
B.—Pyro	2	ozs.
Potass. metabisulphite	¾	oz.
Water	to 80	ozs.

Mix 1 volume A, 1 volume B, and 2 volumes water for use.

Desensitising Bath	Time of Appearance. Secs.	Total Time. Mins.	Secs.	Watkins Factor.
a None	25	5	0	12
b 1:5,000 Phenosafranine	12½	2	30	12
b 1:5,000 Pinakryptol	35	5	0	8½
c 1:5,000 Pinakryptol Green	12	2	25	12

[Notes—*a* Normal contrast; *b* Appreciably weak; *c* Slightly weak; image of greenish color.]

ACTION ON LATENT IMAGE

The action of these desensitisers on the latent image was also investigated, and it was found that there is no destruction whatever caused by either Pinakryptol or Pinakryptol Green, even if prolonged action of the 1:5,000 bath is allowed. The very pronounced retardation of development caused by Pinakryptol might lead one erroneously to conclude that some destruction of the latent image is caused by this desensitiser. As a matter of fact, the "threshold" values of two negatives—one of which was developed after a given exposure without a preliminary desensitising bath and the other developed after a similar exposure, followed by two minutes' treatment with a 1:5,000 Pinakryptol bath —are identical. There need be no misgivings, therefore, on the question of interference with the "speed" of a given plate or film by desensitisation with either of these new products. If Pinakryptol is used, it is only necessary to prolong development by something like 25 per cent. to 30 per cent. in order to obtain a negative of normal contrast.

The Cobalt-Iron Process

ENGINEER JOHANN BURIAN

In view of the really impossible cost of silver photo-papers in Germany, efforts to find cheaper, and yet satisfactory substitutes, are the order of the day. Incidentally to some such researches the writer has succeeded in discovering, by an oft-trodden road, a new photographic printing-process. As this method, after carrying out the preliminary work, gives easily and almost perforce really beautiful brown prints, and is also very interesting theoretically, the most important points are here detailed.

It will be borne in mind that the foundation of the platinum process, which is capable of giving such beautiful results, is based upon the change of ferri-oxalate into ferro-salt under the action of light, so it is perhaps natural to build a substitute method upon this same reaction. The simplest photo-printing process hitherto known is the iron-blue method, in which the scarcely visible ferro-oxalic image, by treatment with potassium ferricyanide salt is changed into Prussian blue. As is well-known, with the iron process properly carried out, it is possible, without further treatment, to make from a line negative a faultless print in point of clearness and purity of the paper background, in which nothing but the unsuitable color is objectionable. It is to be noted that, with good paper, all preparation may be dispensed with, so that retouching with India ink or color can be done without difficulty, which is often desirable in the copying of plans, etc. Hence success could be obtained with the iron-blue process if it were possible to change the unpleasing blue color by an after-treatment into a brown or blackish color. In spite of many attempts, however, the writer has not succeeded with any of the methods so far recommended, in obtaining useful results. The changing of the color can indeed be done without difficulty, but only with the most careful handling can a white ground be retained, since the very thorough washing of the paper incurs too many risks.

As the toning of blue-prints was found to be impracticable, it was thought it might be possible to obtain, with a single development, a suitable color by using some other metallic combination than that used for the blue-prints. For this a most suitable combination would be one that on developing with ferricyanide or by a supplementary mixture that would not affect the blue-

print, but would give a deep red or orange color which, when laid over the blue would produce a blackish tone.

Starting with this consideration, the first tried was the Lumière cobalt process, which, when developed with potassium-ferricyanide, gives a rose-colored print—all the more that this process is based on the transformation of cobalti-oxalate into cobalto-salt and therefore runs parallel to the normal blue-print process, for which reason it may be accepted that a simultaneous sensitizing with a mixture of ferri- and cobalti-oxalate would meet with no great difficulty and the hoped-for effect of a change of the homely blue might be obtained. The Lumière method of carrying out the cobalt method presents great difficulties, first because of the irrational preparation of the solution in which, for making the cobalt-oxalate, an excess of the expensive cobalt hydrate is required, and second, its limited durability of only a few hours. Besides, the Lumière instructions give only weak tone prints which, during the subsequent toning of the resulting rose-colored prints with sulphite of soda, show a strong tendency to discolor the paper.

The usual means for clearing platinum prints here fail completely; but the double salt of ammonium, as used in that process, gives beautifully clear prints, while in sodium sulphide toning, owing to the difficulty of washing out the unexposed salt, it is very apt to give spotty paper. The use of the double salt—cobalti-ammonium-oxalate—offers still another advantage—the unusual durability of its solution, since after keeping for two months, it gives perfect prints. To be sure, after long standing, as a result of the beginning of precipitation, a rose-colored coating forms on the sides and bottom of the container, but the solution itself remains clear and usable. Finally, the solution is quickly and easily made with the ordinary utensils.

As soon as the cobalt solution is ready, the mixed ferri-ammonium-oxalate sensitizer can be applied. This is done in yellow light and the paper covered with the mixture, when dried, takes a pale green tint which, on exposure to the light, turns to yellow, by which the printing can be easily followed and the correct time for stopping readily judged.

So there exists simultaneously an image in both ferro- and cobalt-oxalates which, on being developed, even with diluted solutions, does not wash off, but sticks to the paper. Moreover, the *unexposed* oxalate salt is very easy to wash out. These properties, together with a short scale of tones, favor a pure white paper ground, but the color of the print—a combination of blue and rose—is gray and is not strong enough to be used alone; with longer exposure, the print takes a stronger blue tone. If the print is now toned with a dilute, freshly-made solution of sodium sulphide (1 part to 400), the surprising result is a clear brown color which, if too long time in the sulphur-bath is avoided, gives also a fine white paper.

WORKING DIRECTIONS

The extremely light-sensitive sensitizing solution consists of two parts of the cobalt solution A and one part of the iron solution B, and must be kept in brown bottles in a dark place.

A. *The Cobalt Solution.*—This consists principally of a 30 per cent solution of cobalti-ammonium oxalate. A very convenient way of preparing it is as follows: In a large tumbler, put 8 grammes of oxalic acid and 30 ccm. of distilled water; warm slightly in a water-bath. When dissolved, add 24 grammes of ammonium-oxalate (neutral); as soon as this is dissolved, add 8 grammes of dry, finely-powdered cobalt-carbonate, which is partly dissolved with effervescence. After long digestion in a water-bath, a raspberry-red solution results, which is allowed to cool, with occasional stirring, to 95° or 100° F. To it is then added 5 grammes of pulverized lead-superoxide and 2 or 3 ccm. of acetic acid, which immediately changes the color to green. After a few minutes, during which the liquid is shaken repeatedly, it assumes a dark-green color. The following operations, which consist first in a further addition of 5 grammes of lead superoxide and 3 ccm. of acetic acid, must be carried on by yellow light. In about 15 minutes the liquid is filtered and water added to make 100 ccm. This gives a solution of about 30 per cent of cobalt-ammonia-oxalate. The excess of other combinations present, however, keeps down the light-sensitiveness of the solution, for which reason it is better not to filter it, but to place the mixture in an open tray in a dark room and allow it to dry without heat, which will take from 24 to 28 hours, according to the size of the tray. The crust of crystals is then softened by adding 10 ccm. of water several times; in this way the double cobalt salt dissolves readily, so that with about 80 ccm. of water, a complete separation of the oxalate compound is effected; the filtrate

is then extended to 100 ccm. In case cobalt carbonate cannot be obtained, it may be precipitated with a solution of sodium carbonate from any water-soluble cobalt salt. The precipitate is collected in a cloth filter and well washed without alkali, dried and pulverized in a mortar.

B. *The Iron Solution.*—This is a solution of ferri-ammonium-oxalate (1 to 2) in distilled water. As there is no particular difficulty in preparing it one's self, the mode of procedure is here given. In a measuring-glass put 36 grammes of pulverized *acid* ammonium oxalate and add alkali (free washed ferri-hydrate precipitated cold with NH from 20 grammes of iron-sulphate). The quantity of ferri-hydrate, thus obtained, is larger than required, and therefore a quantitative transfer from the filter to the measuring-glass is not necessary. The glass is filled to the 100 ccm. mark with distilled water and the solution hastened by stirring with a glass rod. As soon as all the crystals have disappeared, the excess of iron hydrate is filtered off and the glass filled to 100 ccm. Yellow light and dark glass bottles are now necessary.

The acid ammonium-oxalate can also be prepared by one's self by pouring 30 ccm. of caustic ammonia on 100 grammes of powdered oxalic acid and stirring with a glass rod, then warming slightly and adding cautiously more ammonia till dissolved. It is recommended to add a few drops of methyl-orange as indicator: as long as free oxalic acid is present, the liquid will remain of a reddish color, but after complete saturation, the color becomes yellow. If inadvertently too much ammonia should be added, which will be recognized by the fumes, set the container in a water-bath until the fumes disappear. The liquid will now contain a neutral ammonium-oxalate. In order to have an acid oxalate, another 100 grammes of oxalic acid is added and dissolved by moderate warming, and the addition of water, and then cooled to the temperature of the room, when the bulk of the double salt will crystallize out. The crystals are separated from the liquor by filtering. By evaporating and again cooling, a further portion of the salt can be gained.

Preparing the Paper.—This is to be done in a dimly-lighted room, the sensitizing liquid being applied with a wide brush, the same way as with the gum and platinum processes, so further details are unnecessary. A good thing, but not absolutely indispensable, is a badger distributing brush. As soon as no more liquid likely to drip can be seen, the sheets are hung up to dry, but artificial heat must be avoided, because strong heat causes precipitation of the cobalt and discoloration of the paper. Complete dryness can be recognized by a slight inward curving of the coated side. The paper will keep for about 30 hours, so that any left over may be used next day.

Printing.—This may be done by electric or other artificial light. Frequent examination, to observe the progress of the work, is not necessary, owing to the great sensitiveness of the paper; but time should be noted or a photometer used.

Development.—This is done in the same way as with ordinary developing-papers, using potassium ferricyanide, 1 part to 100 of water. Of course, in preparing a stock solution (1 to 10), no precipitated salt should be used. The development proceeds rapidly (from 1 to 2 minutes). Too long time in the developer is apt to discolor the whites. Rocking the tray is recommended. The developer is poured back into a measuring-glass and the print well rinsed with water on both sides and then placed in a muriatic-acid bath (1 to 100), which can be done in the same tray. After pouring off the acid and again rinsing, the print is placed in another tray containing a solution of sodium sulphide (1 to 400). Rocking the tray constantly, the increasing strength of the print is watched until it takes a full brown tone. As soon as the whites show a slight gray tinge, the toning-bath is quickly poured off and the print thoroughly rinsed with water, and then hung up to dry, during which the grayish tone disappears completely. While the developer, protected from light, and the muriatic-acid bath can be used repeatedly, the reduced toning-bath requires frequent renewing. The whole operation is finished in a few minutes and gives, provided the exposure has been correct, a very satisfactory and comparatively durable sepia print.—*Condensed from Das Atelier Photographen.*

Acid Amidol for the Busy Printer

The respective merits of amidol and M. Q. have often been discussed in these columns, but there is no getting away from the fact that amidol is extremely popular with the trade printer. The fact of it being a neutral solution (or practically so) makes it suitable for the water of some districts in preventing the formation of insoluble

compounds, which give the prints a gritty surface. It is very simple to make up, and has considerable covering power.

The chief disadvantage of amidol is that it does not keep in solution. Three days is considered to be its effective life, but I have found that with both neutral and acid amidol the covering power is very feeble after two days. However, this is not such a formidable disadvantage when one can keep a stock solution of sodium sulphite and add dry amidol as required just before using. After the continuous use for some months of an acid amidol developer for many thousands of prints and enlargements on bromide and contact prints on gaslight papers, I find it excellent, clean-working, constant, and what might be called a "business proposition." I do not notice any improvement in the keeping properties of acid amidol, but it is quite regular in use, due, I think, to the acid sulphite solution being constant and not so liable to deteriorate as a plain solution. The image builds up in the usual way, and development of bromides is complete in two minutes with ¼ grain of potass bromide to the ounce of developer. Some makes reach finality in 1½ minutes. Gaslight prints develop in one minute, or sometimes less with the vigorous papers. Well diluted, it gives excellent colors on the slow development papers.

The formula given below is suitable for practically all development papers. The acid sulphite solution is made up in a four-gallon jar with a wooden tap fitted for drawing off the required amount. This jar is placed on a strong shelf at a convenient height, and a small hanging jar is kept under the tap in case of slight leakage.

Stock Acid Sulphite Solution

A. Sodium sulphite cryst.) ....8 lbs.
Water (hot) about..3 gals. (480 ozs.)

B. Potass metabisulphite ....2½ ozs.
Hot water .... ½ gal. (80 ozs.)

When cool, mix by slowly adding the metabisulphite (A) solution to the sulphite (B) solution, and make up to 4 gallons with water. To make a working bath, use the following proportions:—

Working Bath

Acid sulphite solution	40 ozs.
Water	40 ozs.
Amidol (dry)	200 grs.
Potass bromide	(See the following)

The potass bromide plays such an important part in affecting the color of the image, time of development, and prevention of fog that special care must be taken to ensure accuracy. This salt should be made up in a 10 per cent solution, and always accurately measured out, bearing in mind that the average amount required for bromides is ¼ to ½ grain to the ounce of developer. In a 10 per cent solution every dram contains six grains, every 10 minims contains one grain, and every minim (or drop) contains 1/10 grain.

Bromides and gaslights develop to a nice black color with ¼ grain of potass bromide to the ounce of developer, and to obtain a warm or olive black on gaslight, chloro-bromide, or studio development papers, it is necessary to add more (up to 6 grains to the oz.), and also to dilute the developer. It is interesting to note that in diluting the developer for gaslight papers the contrast with the vigorous grade is increased, but quite the reverse happens when using a diluted developer for bromides. Potass bromide has little or no influence upon the contrast given by any particular paper, but it is in practice absolutely necessary to prevent fog and to control the color of the image. Absence of bromide will give quite a blue color on gaslight, but the whites will often be degraded.

The following table may be useful for reference when a particular color is desired:

The latter color is produced on bromides that are to be toned in the hypo-alum bath. The development is stopped short of finality, so as to ensure a warm sepia tone in this toning bath. Bromides developed to finality give a rather cold tone in hypo-alum.

Fixing Bath

Hypo	18 lbs.
Hot water	34 quarts

When cool add the following solution:—

Potass metabisulphite	5 ozs.
Hot water	2 quarts

It is convenient to make up a large fixing-bath for a busy man. The formula is as given above. I am lucky enough to have a large white earthenware sink holding 40 quarts easily, and this is fitted with a pull-out plug. There is also a steam pipe fitted under the sink for use in winter or on cold days.—B. R. RAWKINS *in The British Journal of Photography.*

Will Photographic Research Upset the Wave Theory of Light?

This in itself is not at all disturbing to the average person. Light has in no way changed and never will. But it is interesting to know that this mysterious and elusive thing which enables us to see and which has made photography possible, may be better understood and its action more clearly diagnosed because of photographic research.

The nature of light has been the subject of one of the most famous controversies of science. Sir Isaac Newton held that light consisted of distinct particles or corpuscles shot off from the source. Traveling with extreme velocity, they bombarded any object in their path and were reflected to the eyes of the observer, where they produced sight.

This theory had the advantage of explaining reflection very easily and with some difficulty Newton was able to explain the bending of a ray of light when it entered a transparent substance, such as glass or water.

But there were difficulties which displaced this theory for the "wave theory." According to this theory, light was held to consist of small waves of a definite high velocity traveling in a medium termed the "aether."

This theory was adopted at the beginning of the nineteenth century and has proved very satisfactory, especially after investigation showed that these waves could be treated as an electromagnetic disturbance in the aether.

Recently, however, a number of things have been observed which are difficult to explain by the wave theory, and it may be necessary to turn again to a theory similar to Newton's.

The origin of light is now ascribed, not to molecules or even the finest division of matter, the invisible atom, but to particles of negative electricity called "electrons," which are supposed to revolve around the nucleus of the atom which carries a positive electrical charge, the atom as a whole being electrically neutral.

We will admit this is a pretty deep theory for the layman, but the scientist insists that theory is nothing more than an explanation of facts, so we must take his word for it.

If a shock disturbs the revolving of these electrons, if they impinge on one another and are then attracted back to their nucleus, they give off pulses of energy in the form of waves in the aether whose frequency is proportional to the energy which the electron releases.

The wave length depends upon the frequency; the more waves in a given time the shorter they must be since the velocity of light is always the same. The wave length also determines the color of light. X-rays differ from light rays because their frequency is a thousand times as great as light. This gives them their penetrating power.

The new light that has been thrown on the question of the radiation of light is due to the study of photographic films. It has always been a mystery how a photographic emulsion adds up light during a long exposure, looking at it from the wave theory. The emulsion consists of microscopic crystalline grains, most of which have definite forms when viewed under a powerful microscope. Some are large, some are small but in clumps, and some are barely visible as specks under the highest powers of the microscope.

When these grains have received sufficient exposure to light, they become developable. But the difficulty has been to determine how they added up the light until they had enough, for it is quite certain that it is not necessary for them to get the light impression in any definite time.

For example, if a film is exposed under a telescope to the image of a star, an exposure of five minutes may not render any grains developable. Some action has occurred, however, for at the end of several five minute exposures a few grains can be developed, and after several hours of exposure, a good image of the star can be developed.

The hard thing to understand is how the sensitive grains can store up the billions of light waves that fall on them. We know they must because if the exposure is only half made and then started again weeks later, the grains will not have lost their record of the first exposure. The second exposure will start practically where the first left off.

It seems that the large grains are much more sensitive to light than the smaller ones, but if a number of grains even of the same size are sorted out under the microscope and exposed to a uniform flow of light, some will be developable before others, which would seem to indicate that even grains of the same size differ in sensitiveness.

If it were possible, however, to see these grains develop as fast as they received the necessary amount of light, you would

hardly be able to imagine a continuous stream of light falling on them. You would imagine that the light was raining on the grains, hitting them here and there, and the effect would be that of raindrops falling on a dry sidewalk until finally the entire walk became wet.

Apply this theory to the effect of light on the grains of a sensitive film and you have the explanation of why large grains are most sensitive. They are more likely to be hit. This theory is made stronger because we know that light striking any portion of a grain makes the entire grain developable.

This assumption was made by Dr. Ludwik Silberstein, who is studying the problem in the Research Laboratory of the Eastman Kodak Company. He likens light to a rain of projectiles which he calls "light darts" and has been able to calculate the relation between the size and the number of grains that will be developable after a certain exposure, a relation which has been most accurately confirmed by special experiments in the same Laboratory. And from the rate at which grains of different sizes become developable, the average diameter (which appears to be very minute) of the projectiles or darts of light can be calculated. And this has been done.

On any chemical theory, it is very difficult to imagine that one grain is more sensitive than another, while a number of calculations tend to prove the new theory of a rain of light particles to be more likely correct than that of an unbroken stream of light.

Of course many questions regarding the new theory remain unanswered. Because it is new, it will have many difficulties to meet. It offers much food for scientific thought and will lead to many experiments.

If it is eventually accepted, it may prove of much value, as all scientific work eventually does, for all of the advances in the material advantages of our modern civilization may be traced either directly or indirectly to some laboratory of research in which a pioneer has discovered a new basic principle.—*Studio Light.*

In the new catalogue of J. H. Dallmeyer, Ltd., London, England, we note a new lens listed—the Pėnlac Anastigmat—with a working speed of *f*2.9 up to and including the 5x7 size, also the Dallon Anastigmat Fixed-Focus Telephoto lenses with apertures of from *f*5.6 to *f*6.8, permitting a magnification of 2½ times.

Temperature and Sensitiveness

It is sufficiently well-known that chemical action is more energetic at an elevated temperature than when the thermometer falls. From time to time experiments are renewed as to the variation in effect upon exposures made upon films at different degrees of temperature. Here, too, it is found that heat increases the sensitiveness while cold reduces it. Exposed to intense cold, such as is obtained by the use of solid carbonic acid, the film is but slightly affected by the action of light.

Prof. Jolly has experimented to determine the degree of variation. He found that the reduction in sensitiveness was by no means uniformly progressive and that the character of the film had an influence. Orthochromatic plates showed greater variation than ordinary films. The tendency of cold is to neutralize the color sensitiveness to certain bands of the spectrum. He found that the cold but slightly affected the sensitiveness for the blue and the violet but was particularly manifest in the green, yellow and orange rays, thus completely destroying the ortho-chromatic effect Of course in practice the wide range of temperature is not met with which Prof. Jolly employed and in all probability the photographer would find but little if any difference in exposures of plates at the poles or at the tropics.

Some Causes of Failure in Autochrom Work

The autochrom process is, I think, rightly regarded as among the simplest of the present-day methods of producing photographs in natural colors, and though the manufacturers of the autochrom plate give specific and minute directions for their manipulation, many photographers, even after a fairly lengthy experience, do not obtain results as good as the process is capable of giving.

One of the most prolific causes of failure in securing autochrom transparencies pleasing as regards brilliancy and rendering of color can be traced to the fact that many exposures are made under dull lighting conditions. The light in this country, even at its brightest, is none too good for color photography. Under dull lighting conditions, while the plate may render the colors up to a certain degree, the visual brightness that we associate with the subject is lacking: the transparency looks dull and spiritless. It is not generally realized by those who have not had a grounding in the scien-

tific principles of color that the brilliance of the coloring in any object depends almost entirely upon the strength of the light illuminating it. If, for example, we examine a deeply colored orange in a shadowed corner of a room we shall be sensitive of its color in only a slight degree. If we take the same orange to a more brightly lit part of the room near a window we shall be impressed by its color still more; while if we take the same orange into bright sunlight its coloring will be more brilliant still. I would go so far as to say that the orange when examined in the dark corner of the room looked almost *colorless*, and probably the impression as to the room looked almost *mental* rather than a *visual* one. The color of the orange was known, and this fact influenced to a great extent the idea formed of its intensity of coloring. By way of emphasizing this point still further, if the orange is placed upon a table near a window, the light coming from one main direction, it will readily be observed that the color is more intense where the light is strongest while on the extreme shadow there is little or no color visible. It is there, of course, but the light has not brought it out. Now a color photograph taken of this orange would be unsatisfactory. There would be a small area of color upon the orange, the rest being in shadow, and, reflecting no colored light-rays, would be seemingly inaccurate. The picture would be accurate, but as a color photograph distinctly unpleasing. If the autochrom worker can only grasp this point fully at the outset he will go far to avoid one of the most prolific sources of failure. I do not mean to infer that it is not possible to make quite good autochrom under dull lighting conditions, but rather that the best results are certainly only to be obtained under the most brilliant lightings. We are so used to thinking of the brilliance of the colors when viewed under sunlight that we do not fully realize what a great difference an absence of sunlight really makes.

Further, it seems that the very weak light-rays emanating from shadow detail cannot pass through the screen of an autochrom plate unless a very full exposure can be given, a fact contributing towards lack of color in the deep shadows. In this respect the average autochrom rendering of a sunset is often disappointing. There is a central spot of color in an area of black shadow, which, though satisfactory from the scientific point of view, fails to please as a picture. I would most strongly emphasize that all exposures should, as far as possible, be made out of doors, even when taking autochroms of flower, fruit and still-life studies, for, unlike monochrom work, where we need shadow and tone, the autochrom needs color, and the strongest possible even lighting is required to bring this out and avoid contrasts.

The question of exposure, where so many workers go wrong, is best settled by a careful calculation with an actinometer that makes an actual test of the light, the indicated exposure being very accurately timed. Ten per cent of the time may be added with advantage if the light is dull or with a view to allowing for any slight lessening of the speed of the plate after its manufacture. Many autochrom transparencies that I have seen bear abundant evidence of the fact that the question of the exact exposure has not had the amount of attention necessary.

As regards dark-room manipulation, the safe-light recommended by the makers should always be used; and this requires to be most carefully employed if it is not to affect the color of the autochrom plate. I have seen many autochroms possessing a greenish blue tint that has very obviously resulted from too close an inspection by the Virida light. This should be kept at least 4 feet from the plate, the latter always being shielded from direct rays.

I recommend that whenever the exposure is known to be correct the plates should be developed in a tank by a reliable time and temperature system. This will produce far better results as a general rule than the old method of judging the progress of development by inspection. In fact, even after a considerable experience this is no easy matter, and incorrect development may be regarded as a very prolific cause of failures, even when the exposure was correct. Using the highly concentrated solutions recommended for autochrom plates, the image appears very rapidly, and the plate quickly begins to blacken over. Owing to this fact and the necessarily weak dark-room light, the degree that development has progressed is not easy to judge. Even if tank development is not adopted, the time and temperature system should be employed. The chief danger is under-development in the first bath. If this happens, the first image, being weak, leaves too much unreduced silver after reversal, with the result that after the second development the autochrom is dull, opaque and lacking in brilliancy of color.

Trouble sometimes arises from a lack of understanding upon the part of the photographer that an autochrom film is far more delicate than an ordinary dry plate, and will not stand rough washing; prolonged immersion, in solutions, or solutions of abnormal strength, handling with hot fingers, etc., without risk of mechanical damage. The film must not be touched while wet with the fingers. If proper cleanliness of solutions, dishes, etc., is observed there should be no need for this.

An otherwise good autochrom may be spoiled through needed after-treatment being postponed until the plate has dried. If an autochrom transparency, after the second development, is found to need intensification or reduction, this should be proceeded with at once, for if the plate has once been dried re-wetting is almost certain to produce green spots, if not worse. After-treatment which involves prolonged immersion of the transparency is to be avoided if possible, but my own experience has been that if strict cleanliness is observed, the plate handled as little as possible, and immersed for as short a time as is consistent with the effective action of any solution at normal strength, few failures will occur.

Finally, some autochrom transparencies, after coming from the second development, are of an unpleasing brownish tint which detracts from the beauty of the coloring. If this is found to be present the reversing bath may be diluted to about one in forty, and the autochrom, after well washing, immersed in this bath. Great care must be taken not to leave the plate in the solution too long: half a minute at the outside is sufficient to clear the image; longer action may greatly reduce the image. Though not generally regarded as essential, most autochroms are the better for the clearing bath, especially if the colors are inclined to be dull. The plate should be washed for about four minutes afterwards.

At the present time most of the early difficulties have been satisfactorily overcome, and the production of perfect color pictures is a certain and simple matter. The makers point out that owing to the extreme delicacy black spots do sometimes appear in the emulsion, but in my own case it is rare to find them, and as a general rule if a plate gives an unsatisfactory result the worker himself is usually to blame.—Robert M. Fanstone *in The British Journal of Photography.*

The Value of Photographic Literature

Dr. Johnson used to remark, in his peculiarly pleasant autocratic way, that he never read a book until it had been published at least a year. By that time he presumed it would either establish a reputation of worth, or go to feed oblivion with its decay. If photographers would follow the old Dictator's plan, it would go ill with us poor publishers of weekly periodical literature. But, of course, photographers cannot profitably follow such advice or they would be back numbers themselves—not worthy the perusal at the end of the year. However, it has occurred to me, in the recalling of this pronouncement of the little value in most ephemeral literature, that much of value lies hid in books of long ago. Personally, I have found it worth the while to retrace the steps in our progress, and to glean profitably from the path over which the earnest and enthusiastic early workers in our profession have traveled, though at times we have, when we ventured to publish some record of past experience, encountered the retort that we were too fond of ancient history. Full many a process, way back, has been found lying undiscovered, which long afterwards found its way as an important factor (rediscovered of course) in photographic practice as intensifier or reducer, toning or other agent of manipulation. We see all this now by the light of modern methods. But is it not true that in photography, as in other studies, it too often is our habit to be led by the opinions of the latest authorities only, and to neglect the original sources, where, in the glow of the all-important discovery of the time, many a good idea, casually struck off, is suffered to cool and lie forgotten for years amongst the literary junk of the past? We are sure there are many such undeveloped suggestions which the master minds of our art have left for us to work up, and which may possibly reward us by a discovery. He who merely gathers information for its present practical value in dollars and cents, does well enough to pursue the shortest course to his goal, but the student who honestly wishes to advance the science, will not hesitate to go backward and glean the scattered truths, binding them in a sheaf, as we do, for the threshing of some one who may appropriate them for the benefit of many.

Stability of Persulphates

If the persulphates of potassium, sodium and ammonium are compared, it is found that the last is the least stable both when heated dry and in aqueous solution. This may be explained by supposing that the NH_3 is oxidized to N_2. The aqueous solution of these salts is slowly decomposed in the cold, more rapidly at about 35°, and very rapidly on boiling. The decomposition is made slower by the addition of Na_2SO_4, and accelerated by the addition of acid or a large excess of fixed alkali. NH_4OH accelerates the decomposition owing to the oxidation of NH_3 to N_2. Direct sunlight very greatly accelerates the decomposition of these solutions.—*Chemiker Zeitung.*

Utilization of Veiled Plates

G. Chierchia has a short article in *Il Corriere Fotografico*, under the above title. It is not made quite clear as to what degree of veiling or the conditions under which it was produced are in question, but his motive in discussing the matter is principally on account of the present high price of plates, making it worth while to take some trouble and go to a small expense to use material that might otherwise be thrown away. He speaks first of treatment of undeveloped plates. In what way these are known to be veiled is not explained. The procedure with these is to immerse them, by red light, in the following bath:

Water	1000 c. c.
Potassium bichromate	20 grams
Nitric acid	3 c. c.

After three minutes' immersion, the plate is removed, well rinsed in order to eliminate all of the bichromate, and dried. It can then be used as a plate in good condition, but is slightly less sensitive. Another method affects less the sensitiveness of the plate. It consists in immersing in the following bath:

Water	100 c. c.
Ammonium bromide	2.5 grams
Sulphuric acid	1 c. c.

The plate should soak for about three minutes, the operation being carried on under safe light. The plate is well washed and immersed for five minutes in a 1 per cent solution of urea in water, after which it is dried without special washing. In this procedure mention is made of adaptability to old plates.

If the veiled plate has been developed, but not fixed, the following bath is recommended, the plate being previously well washed to remove all traces of the developer:

Water	100 c. c.
Potassium bromide	5 grams
Potassium bichromate	3 grams
Sulphuric acid	2 drops

In this solution the plate becomes white. After five minutes it is well washed, drained and immersed in a solution made by adding five parts of ammonia solution to 100 parts of ordinary water. After a few minutes' immersion, the plate is well washed and dried. As in the other cases, the operation must be conducted in a safe light. Plates thus treated are slow, but are suitable for lantern slide work.

Stability of Panchromatic Plates

La Revue Française de Photographie abstracts from a German journal data on this subject, obtained by L. Stenger, who tested plates from 12 to 19 years old, including 14 varieties representing the two methods of applying the special sensitizing dyes, namely, incorporation of them in the emulsion and immersion of the plate after coating. The deterioration of the plates is shown by a general veiling and by a marked deposit along the edges. The latter is largely due to the paper separator, being seen in all old stock. While the immersion method gives a better plate for early use, the keeping qualities of the other are better. It is stated that by maintaining plates at a temperature of about 130° F. for several days, an effect can be obtained somewhat like that which follows long keeping at ordinary temperature. Plates ripened by means of ammonia do not keep as well as those that are neutral or slightly acid.

Toning Bromides with Copper Bromo-Iodide

There are several excellent formulae for changing to a more esthetic tone the black image obtained on a bromide paper which ordinary development effects. For general purposes this normal bromide tone is most excellent, and to some tastes is all that is artistically desired. Indeed, black and white with rich gradations really suggests color to the imagination, but there seems to be desire among pictorialists for sepias, browns and similar tones. The writer, though personally well satisfied with the normal rich black and white of the bromide

print, is sometimes obliged to acquiesce in the demands of the artists of the profession and get tones more acceptable to their taste. He has found the methods in general use as having a tendency to change the tonal value of the original, and, in his judgment, to lessen frequently the picture's original beauty. He has, therefore, sought for a plan more likely to preserve the original values, and would suggest the following method.

The bromide print, after development, should be well washed from all traces of hypo salt. To insure complete elimination of the hypo after the usual thorough washing of the print, immerse it for five minutes in a strong solution of common alum, and again wash in a running stream for a quarter of an hour. Now, make up the following:

Copper sulphate	200 gr.
Water	6 oz.

To this solution add, with constant stirring, a little at a time:

Potassium iodide	16 gr.
Potassium bromide	40 gr.
Water	2 oz.

A slight precipitate of copper iodide is formed; allow this to subside and pour off the clear liquid. Soak the print in water. drain off and place in a porcelain tray, and cover the print with the above solution, just sufficient to make a very shallow layer on the print. Now expose to strong sunshine. You will notice a bleaching action set up at once, the film assuming a light canary color. Continue the action until the bleaching is uniform over the whole surface and the shadows, when you hold the paper up to the transmitted light, look transparent.

The bleaching operation requires about 10 or 15 minutes.

Now remove the print from the solution and wash for 15 minutes or so in a stream of cold water.

The print is now ready for the toning. Use a strong solution of sodium sulphite, in which a few grains of silver nitrate are dissolved, or you may use the hydroquinone or other developing agents to darken the image. Old developing solutions seem to act more uniform. The color of the image is affected by the character of the developer used to darken. Hydroquinone gives light brown to sepia tones; eikonogen does not give vigor enough, so we do not employ it. Rodinal and amidol, with a few drops of 10 per cent. solution of oxalic acid, give rich browns. A beautiful rose-color tone and also claret shades may be had by the following toning solution:

Hydroquinone	90 gr.
Sodium sulphite (dry)	½ oz.
Sodium carbonate (dry)	240 gr.
Potassium bromide	6 gr.
Water	8 oz.

By varying the proportion of hydroquinone and the sulphite you may vary the tone.

We should have remarked that the paper turns blue during the bleaching process, forming a blue iodide of starch in the sizing of the paper, but this blue color disappears directly on placing the print in the toning solution.

Recent Patents

1,415,230. Photographic Printing and Numbering Machine. A photo printing machine having in combination, means for supporting a negative, means for holding a print on said negative, and supplemental means for holding said print on said negative, both of said holding means swinging about offset parallel axes and having closely adjacent sides extending normal to said axes.

1,413,187. Photographic Apparatus. An apparatus for photographing from an aeroplane while in motion, the combination of a camera provided with an objective and intermittently actuated exposure mechanism, a continuously operating motor, and motor-driven mechanism for continuously moving a sensitive film across the objective at a speed approximately the same as the displacement of the image caused by the flight of the aeroplane, the film moving in the same direction as the image so that the film and image remain relatively stationary during an exposure.

1,417,403. Photographic Printing Apparatus. In a photographic printing apparatus of the character described, a transparent support, a presser coacting with said support and constrained to reciprocatory movement there across and consisting of a pair of spaced rollers, a presser block arranged between said rollers and a flexible band having its ends secured and extending around said rollers and said block and relatively movable with respect thereto, means for reciprocating said presser across said transparent support including a bell-crank lever having a yoke end and a link pivotally connecting each arm of said yoked end to the presser, and a spring for each link connection, each of said springs having one end secured to said lever and the other end secured to said link whereby said presser is urged into contract with said support in all positions.

Formalin as a Hardener for Gelatin

The tanning action of formaldehyde on gelatin is well-known and has been extensively applied in some industries. The commercial solution is generally called formalin. Attention has recently been called in some of the photographic journals to the unsuitability of this solution as a hardener for plates and films. It has been found that after a year or so the gelatin becomes very brittle and scales off. Formalin should, therefore, never be used in plates or films intended to be kept for an appreciable time.

Limiting Date to Use of Rapid-Burning Film

Under date of April 10, 1922, French authorities have formally assigned the first day of January, 1925, as the termination of the privilege of using the rapidly burning cinamatographic film. The decree as published states that the slow-burning film is now practicable, but the postponement is made to allow the establishments plenty of time to readjust themselves to the other method. The decree is very curious and interesting in one respect. The authority invoked rests on certain laws passed during and immediately after the Revolution, and some of the dates cited are in the Revolutionary calendar. Two laws are cited from 1790 and 1791 respectively, and then follow citations of decrees of 12th messidor, year VIII, and 3rd brumaire, year IX.

Deciphering Burned Records

Records charred beyond recognition in a fire at Augusta, Ga., have been made legible by the Bureau of Standards. Chemical means failed, so Raymond Davis, chief of the photographic laboratory, laid the charred sheet between two photographic plates with the emulsion side next the paper. After two weeks of contact, the developed plates gave a plainly readable record. Where there was contact between the charred paper and the plate, the latter was affected, but where the ink had been the chemicals of the plate were unchanged. —*Scientific American.*

The annual exhibition of members' work will be held at The Camera Club, New York, during the month of September in its galleries, No. 121 West Sixty-eighth Street.

WINNING PICTURE IN THE JOHN G. MARSHALL METEOR FLASH POWDER COMPETITION FOR APRIL
MADE BY MRS. EDWIN MEYER, REEDSBURG, WIS.

The Photographic Journal of America

September 1922

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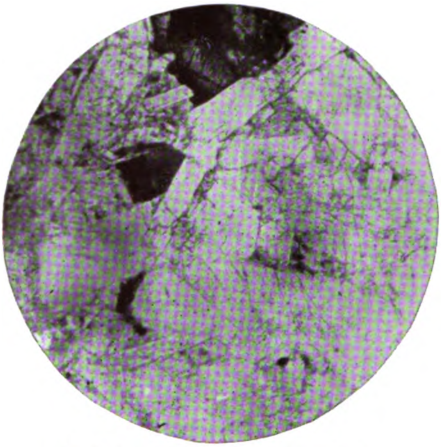
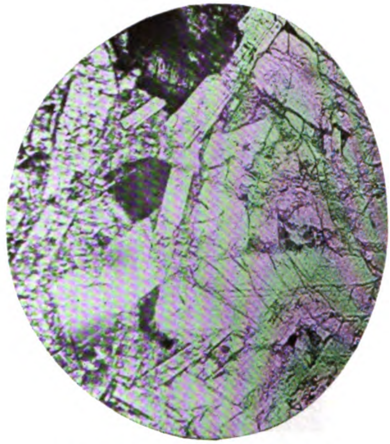
PHOTOGRAPHY IN THE INDUSTRIES

PRINTING has been called "The art preservative of all arts," and Gibbon, speaking of the destruction of manuscripts when the Turks took Constantinople in 1453, says that the mechanics of a German town had fortunately invented an art that enables literature to defy the ravages of time and barbarism. Photography has in many ways displaced printing as a method of preserving texts and illustrations, and its service in this line is extending every day. The photographic *fac-simile* has great advantages of the older methods of engraving. One of the most unfortunate incidents in American history was the method used to obtain the *fac-simile* of the engrossed copy of the Declaration of Independence. It was done by superposition, by which the ink of the original was so damaged that it is now fading and is, indeed, in bad shape. Had modern methods of photography been available, splendid copies could have been obtained, and the original would have been none the worse.

A national association has recently been formed to promote development of photography and microscopy as applied to the great variety of technical problems. Notice of the organization meeting and of the officers and rules of procedure have already been published in THE PHOTOGRAPHIC JOURNAL OF AMERICA. Arrangements have been made to hold an exhibition in New York City in September, at which the many applications of this department of photographic art will be shown. This exhibition will not only have the effect of calling attention to the extensive development already attained in these fields, but will indicate the lines along which further invention and discovery are needed. When we look back upon the handicaps of former years, when all revelations of the microscope had to be drawn with the cameralucida, we can appreciate the advantages that the modern worker, in research or practical



Section of dolerite, X 30 White light.



Section of dolerite, X 30. Red screen.

Courtesy of The Franklin Institute.

application, has over his predecessors. Yet these predecessors did excellent work and they must not be deprecated.

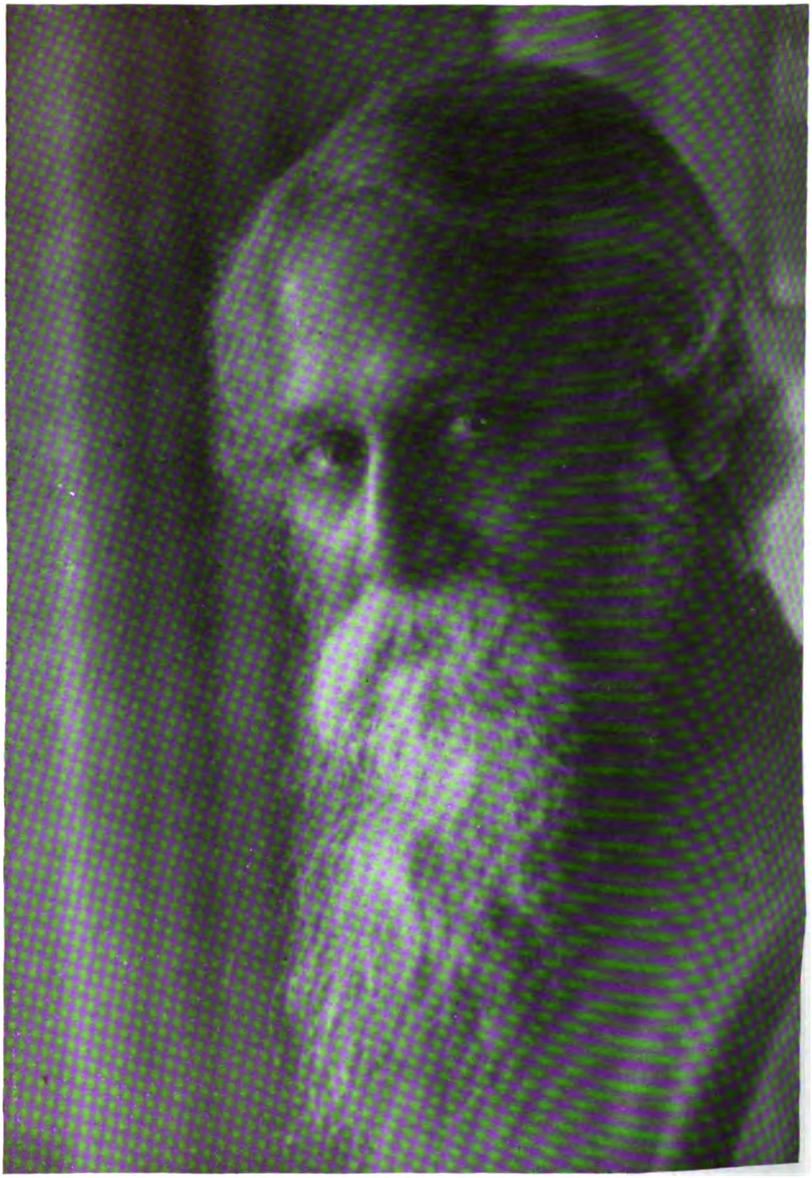
Photographic methods of record have several valuable features: rapidity, accuracy and minuteness of detail. Moreover, the photographic emulsion is sensitive to rays of light not appreciable by the human eye, so that details, not capable of reproduction by the old methods, can be brought out vividly. Color photography, of course, comes much into play, especially in recording the valuable data obtained by the use of polarized light. Screen control gives also many phases that by reason of the peculiar actinic response of the emulsion could not be seen by the eye, and, therefore, not recorded through the camera-lucida.

A comparatively new application of photography to both psychology and

Section of coal, X 120, showing vegetable cells.

Courtesy of The Franklin Institute.

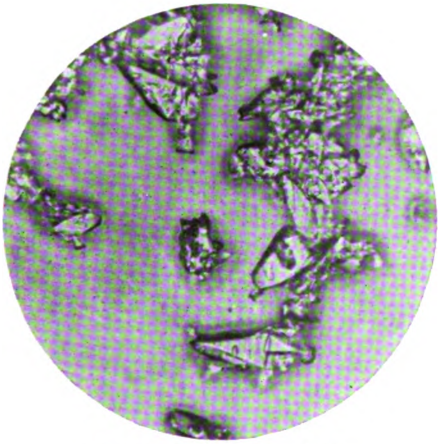
"BRIGHT SMILES" C. SMITH GARDNER



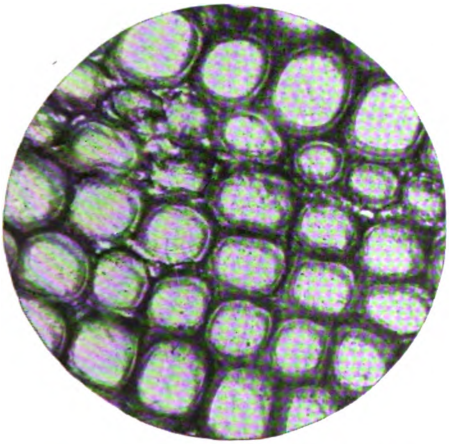
SIR RABINDRINATH TAGORE ORREN JACK TURNER

technology is the use of the rapid motion picture apparatus, with subsequent slowing down in the projection, so that motion details much too brief for distinction by human vision are brought within it. Application has been made of the motion picture in portraiture, a series of pictures being taken from the most satisfactory can be selected, but this is rather an old story.

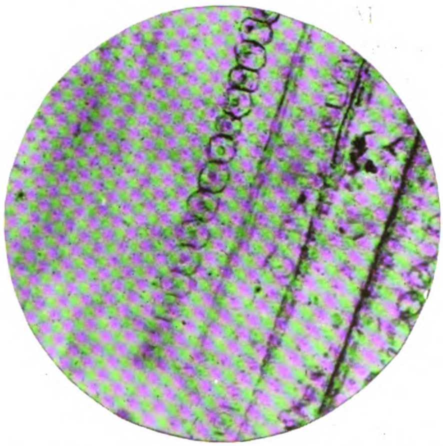
Notwithstanding the many advances that have been made in the application of photography to microscopy, there is still room for great improvement. It has already been noted that the standard emulsions are sensitive over a wider range of light waves than the human eye, and in this way details of structure can be brought out that are not visible in the field of the microscope as ordinarily used. Unfortunately, for a considerable range of the spectrum (the so-called ultra-violet rays), glass lenses and plates cannot be used, as they do not transmit these rays. Even celluloid, mica and gelatin, though perfectly



Crystals of Milk Sugar, X 100.



Transverse section, petrified wood, X 120.
Petrified forest of Arizona.



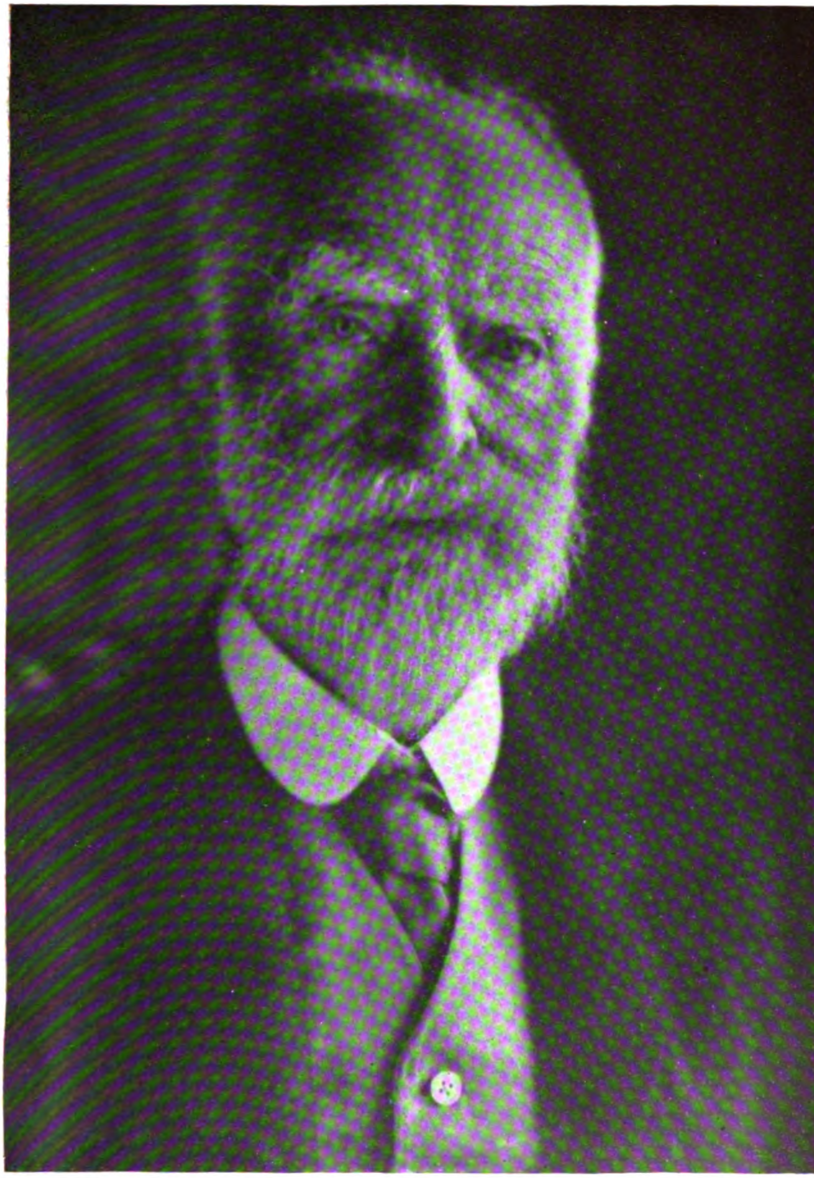
Section of petrified wood, X 120, showing "bordered pits," which indicate cone-bearing trees.

Courtesy of The Franklin Institute.

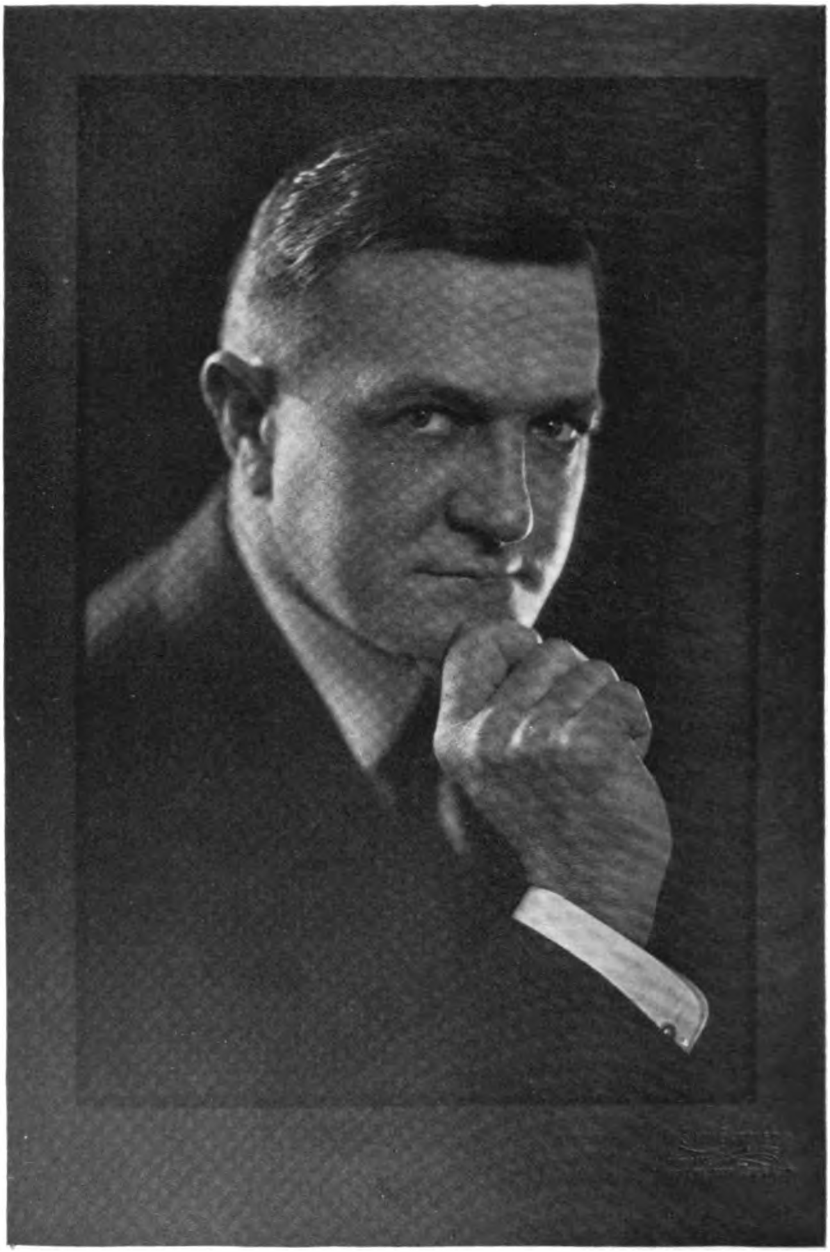
transparent to visible light, stop the ultra-violet. In the other direction, that is, beyond the red end of the spectrum, are also invisible rays, but these are more readily transmitted, passing through glass and other common transparent substances fairly freely. Of the familiar transparent substances, quartz is the only one that transmits ultra-violet light to an appreciable extent. Fortunately, processes are now available by which quartz can be cast into plates and blocks, so that lenses and slides can be obtained without great cost. Heretofore, the only source of quartz for such purposes was the native crystal, large, clear specimens of which are not abundant. For the application of ultra-violet light to photomicrographic purposes, a complete quartz train is necessary. A thin cover-glass will cut out the rays, and even care must be taken, if the illumination is by reflection, that a suitable surface is furnished, for not all surfaces reflect such rays equally. Professor Wood, of Johns Hopkins University, who has paid great attention to this field of optics, found that quartz lenses, covered with a thin film of silver, will transmit practically only the ultra-violet rays, and by this means pictures may be made by invisible light which furnish information not obtainable by other methods. Elaborate apparatus for studying these rays was, and probably still is, obtainable in Germany, but it is to be hoped that under encouragement of the new society, American ingenuity will turn to the subject, and before long a comparatively simple and economical combination of quartz slides and lenses, with apparatus for producing abundance of ultra-violet rays will be available. These rays, by the way, are very injurious to the eye, and in working with such apparatus, the operator should always be protected by glass goggles, eye glasses or spectacles. The rays being invisible, if not associated with ordinary light, focusing must be either by trial or by a fluorescent screen. A good deal of attention has been given to the preparation of emulsions specially sensitive to these rays, and some account of the latest investigations along this line will be found in a recent issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA.

Much less seems to have been done concerning the infra-red rays, which are also invisible to the human eye, but which are transmitted through many common transparent objects, and, therefore, the optical problem is not so difficult. By using certain deeply colored solutions, such as the chromates or coal tar colors, a beam of almost pure infra-red light can be obtained. Professor Wood, by this means, took photographs of trees in full leaf, which show as if covered with snow. The green light reflected from the leaves is cut out by the red screen, but sufficient of unchanged white light seems to get through to affect the plate strongly.

The application of microscopy, with the assistance of photography, to the study of opaque objects, has been brought to a high degree of efficiency and usefulness of late years. Among the objects that are thus extensively studied are the many alloys now used in industrial operations. Much light has been thrown on the characteristics of steel by the employment of such methods, which have, indeed, developed into a special department of applied science, termed "metallography."



VISCOUNT J. D. BRYCE ORREN JACK TURNER



C. SMITH GARDNER

WHAT CONSTITUTES A PICTURE

THE REMARKS here recorded have particular application to the consideration of what constitutes a picture by photography—and not to the pictorial in the general acceptation of the term, inasmuch as there are many photographers who aim at pictorial results by the camera who do not grasp what qualities are essential to pictorial photography. They have seen, perhaps, a view, say a group of trees, seemingly in accord with what they consider pictorial, which is appraised only as a very good record of the subject, but not in the category of the artistic, and they are at a loss for some criterion wherewith to judge the difference between a true record and a pictorial report of the thing presented.

The first thing which the ambitious photographer has to understand in art is the difference between the ideal and the real.

Now, to put this in a concrete way instead of in an abstract one, we shall take an example:

An autochrome may give in form and color an exact rendition of this group of trees, and yet not be a picture as much as a monochrome presentation taken under conditions which give the subject emotional value. The autochrome seems closer to the actual but is nothing more than a mere replica of the bit of nature, while the monochrome, destitute of all the charm of natural coloring, does what the realistic autochrome cannot do, convey an idea which stimulates in the imagination more than the actual possesses. It suggests how the subject appealed to the photographer at the time of its taking.

The delicacy of lace-like net work of leaves of a willow or the majesty of a shapely elm, or vigor of a rugged oak is brought out, rather than the mere facts of the particular tree.

Nature at various times under certain conditions of atmosphere, suggests certain moods of the mind which give opportunity for emotional effect at the expense of accuracy of delineation, which might be more desired by the naturalist but not as acceptable to the artist.

The hopefulness of Spring, the sadness of Autumn, the evening's peace and restfulness, and so on, must be felt by the photographer before he can select the embodiment of the sentiment possible by the photograph.

Sympathetic appreciation of Nature, then, is the great thing to first cultivate.

This expression of a mood or idea is therefore more important than accuracy of rendition. Its possession will lead the photographer to see beauty even in the commonplace. The ordinary becomes the vehicle of the pictorial.

In the selection of his subject, the photo-artist must remember that he has not the same freedom as the painter, because he cannot alter parts like the painter can, to bring out more forcibly the expression of the idea, so he must be careful to see that the parts are already existing in such forms that his idea shall not be obscured.

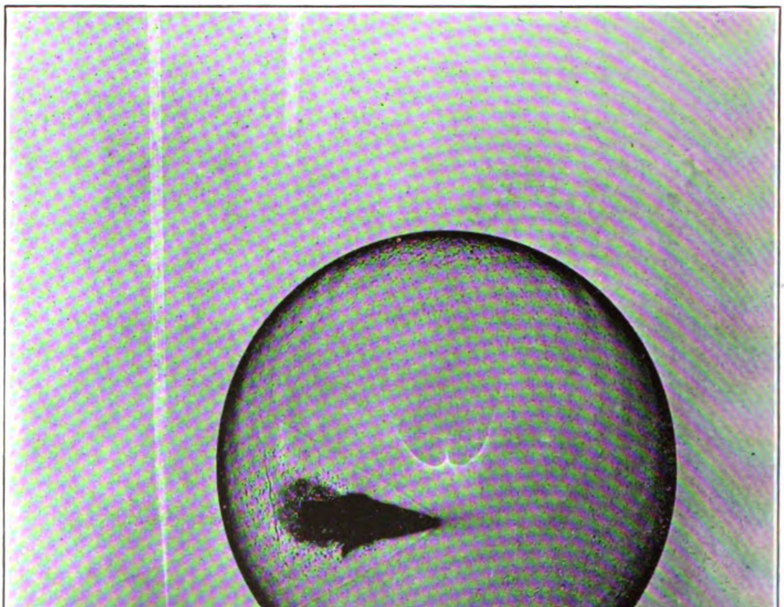
This is his limitation, but withal, at times he does give us pictures which arouse feeling akin to what the painter conveys, but he must confine his work to that which is applicable to camera practice, "bridle in his struggling muse with pain."

The mechanics of his art sometimes is an aid to expression. Even the painter's art has recourse to mechanical device. All good art is decorative, that is, the picture is made up of masses of light and shade and distribution of lines which give a sort of pleasing pattern in themselves.

For instance, the artistic eye is not pleased when it sees a series of regular spaces, but rather by a harmonious arrangement of various areas of different sizes and forms which combine to a unity of design. Again, the question of texture must be considered. Water must look like water, suggest that it is a mobile fluid, not a stretch of level sand; grass present the quality of grass.

The camera is credited with giving accuracy of texture but it sometimes registers false in certain lights. Texture rarely needs be microscopically perfect. It is better that the picture suggest the quality than to have the object rendered so exact that it is obtrusive to the detriment of all else in the picture.

The main thing in any picture is the idea, and certain things may be sacrificed, if necessary, so it is secured.

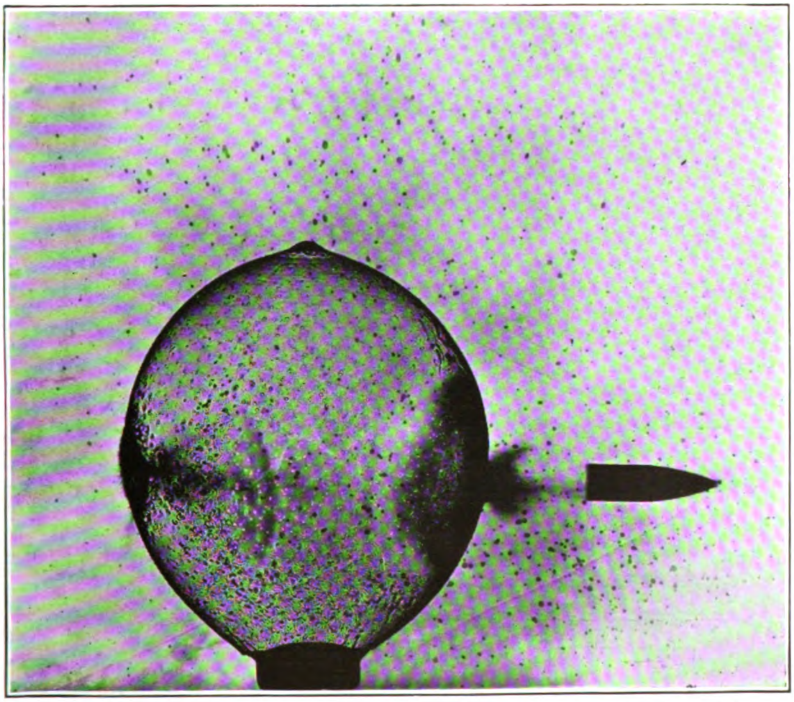


30 CALIBER SPITZER BULLET ENTERING SOAP-BUBBLE

(Quayle: "Photography of Bullets in Flight.") *Courtesy of The Franklin Institute.*

LENSES AND MODIFYING SCREENS

THE tonal school has lost a good deal of its prestige, everywhere, it seems. The general tendency is towards clearer and more optically correct definition. Tonalism, as a popular pictorial expression, could not keep pace with recent scientific achievements. The lenses steadily increased in accuracy of speed and definition, and the novices that constantly recruit the ranks of amateur photography will try their unskilled hands and unpracticed eyes rather in experiments towards precision than artistic breadth of representation, that is, for some time, at least, during the days of apprenticeship. The artistic inclination crops up later. The up-to-date pictorialist does not strive so much for tonal perfection than a certain softness of effect. The clearness of execution, that may be just the thing in a panoramic view or some stunt of a commercial photographer, begins to offend his "exhibition and camera club" trained eyes. He realizes that picture making is, after all, not a scientific process and a matter of microscopic definition (all excellent in their proper place, to be sure), but something that should prove pleasing to the eye. So he avoids harshness and favors softer and more picturesque expressions. With a market crowded with tools of precision that advocate super-exactness as an ideal, this has become more difficult than ever.



30 CALIBER SPITZER BULLET AFTER PASSING THROUGH SOAP-BUBBLE

(Quayle: "Photography of Bullets in Flight.") *Courtesy of The Franklin Institute.*

Ordinary enlargement has become quite an art these days. It is a true helpmate towards softer definition, and much in favor with advanced amateurs as well as advanced professionals. If properly handled, it breaks and flattens the continuity of outline and modifies the sharpness and hardness of details. But this is largely due to the process itself. The image of a small negative will naturally grow broader, contrasts will subordinate themselves to a more uniform middle-tint, and darker and lighter planes will overlap each other, as the picture gains in size the drawing becomes more and more blurred.

The pictorialist wants more than that. He wants actual control of the means of modification. Now what is the method to be adopted? There are many ways. Some pictorialists recommend the use of crude lenses made of optical glass (the word "crude" being used comparatively), and claim that they have achieved satisfactory results. I know of one instance, when a lens of this kind, with an equivalent focus of 8½ inches, was used to make 18 x 24 enlargements from 9 x 12 negatives. The worker, however, complained that he had considerable difficulty with judging values correctly on the ground-glass.

It seems that optical glass can be made to give good service in small-sized portraiture. But is, after all, a rather unreliable procedure. The softness of drawing, which such a lens produces, is the result of the blue light rays being more refracted than those of the rest of the spectrum. But considering that a color sensitive plate, in connection with a yellow filter, represents the ideal material for exact reproduction, we are at a loss how to proceed. The use of a yellow filter, with an optical glass lens, is apt to be disastrous, as the yellow filter (unless very opaque) absorbs just those blue rays which produce the beautifully diffused drawing. It seems to destroy or at least confuse all its special merits of definition on the plate. Without the filter the images, particularly in landscape work, lose all feeling of depth, on account of the extreme focal length of these lenses which do not adjust themselves to small stops.

Diffusing screens are a simpler and much more reliable vehicle. They lend themselves to original exposure as readily as to enlargement. They do not interfere with the clearness of the image on the ground-glass and can be used with color sensitive plates and filters as well as with ordinary plates. Furthermore, they do not demand any change of focus. In exposure, their place is in front, and in enlargement, at the back of the lens.

Older practitioners, no doubt, recall the delicate brass wire nets that were once recommended for the purposes of diffusion. They were coated black and then silver plated, and had a circular opening in the middle, not to interfere with the sharpness of the main point of interests. They were ingeniously enough constructed to be of use even today, but they had the one decided disadvantage, that the silver plating would rub off and cause all sorts of disturbing reflections. An Austrian pictorialist of considerable reputation in photographic circles, even at this late hour, confesses his preference for wire nettings to any of the more recent diffusing mediums.

The latest achievement in this line is home manufactured screens that are at this moment used extensively by European pictorialists. They are made

LORRAINE HARDING NED VAN BUREN

"THE MODEL" JOHN HOWARD PAINE

on the principle of the Meisenbach net, the screen which is used in half-tone reproduction.

Briefly stated, the process of making half-tones is as follows: The subject to be reproduced is photographed through a half-tone screen, which consists of a glass plate, ruled with lines at right angles, ranging (for different kinds of representation) from 60 to 200 lines to the inch. This screen is placed between the lens and the sensitized plate, which is to be the negative. The idea is to break up the image into lines or various sized dots, so that when transferred to a copper plate, it will make a printing surface for the ink roller of the press to operate upon. Without this network of lines or stipples, they would present no chance for the etching fluid to act. The finished result presents to the eye the same effect as the unbroken tones of a photograph. The net in all finer book and illustrative work is scarcely noticeable.

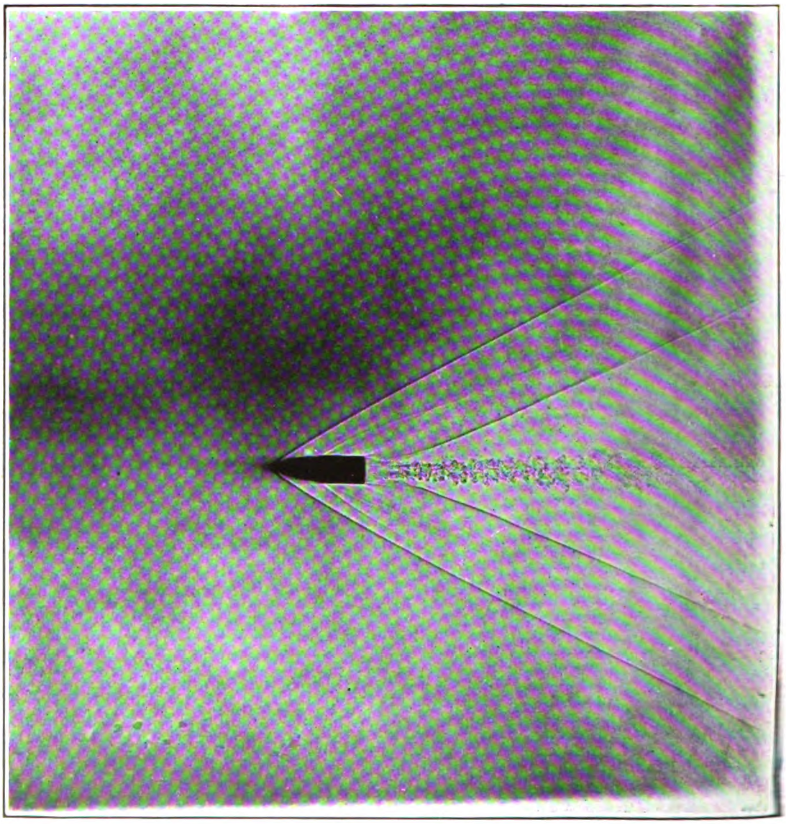
Now, a screen of this kind, applied to the regular photographic image, must necessarily have a softening influence, and it is equally clear that the positive of such a net (2 to 4 inches square) could, by the means of an automatically adjusting ring, be securely attached to the lens barrel. This enables the pictorialist to make all his corrections and to carry out his particular ideas of diffusion at the very start, when he is contemplating his composition on the ground-glass. If it is clear in his mind what he really wants, it will be easy enough to select the proper line and dot designs for a set of diffusing screens that will be of real value in cases of emergency.

Max Schiel, in Leipsic, made some interesting experiments with patterns of lines that cross each other in acute and obtuse angles. He claimed that such patterns were truer to the natural action of the human eye. If we blink, with our eyes looking at a landscape, we see the same in a more picturesque way. Painters have the habit of closing one eye to see things more sharply. This the camera does for the photographer, but what he wants is just the opposite, less clearness of definition. The falling of the eyelids across the lenses of the eye are apt to suppress detail, as the light rays which pass through the minute spaces between the lashes are bent and made to cross each other. The diffusing screens, as is claimed by this pictorialist, operate in a similar way as the eyelashes. But after various tests, he realized that the nets showing lines crossing each other rectangularly were the best suited, as they do not change or distort the drawing.

I hardly think it advisable for an amateur to try and make his own net design, as it has to be drawn on a *very* large scale to stand the necessary reduction, and the execution of such a drawing would necessitate considerable mechanical skill. Besides there are quite a variety of papers on the market which could easily be changed into positives. They are used largely by pen and ink illustrators and newspaper artists, who scrape away the whites and use the network for texture. The latter shows surfaces of stipples, dot shapes of various sizes, regular and irregular in formation, lines running curved, uneven crosshatch, or crossing each other at right angles or diagonally, making meshes of various shapes and length, etc. These papers are ready made and offer

quite a choice as to form, strength of impression and direction of lines. Still, the Meisenbach pattern (lines crossing at right angles and placed diagonally) is the most reliable one—unless you would try and make one in this fashion. Take some wire netting, like an old strainer flattened out, and through its narrow meshes sprinkle, with a watercolor brush, a mixture of sepia and water (not too thin) on a sheet of bristol board. The spray will produce dots of various sizes and strength; get it as even in tone as you can, and you will finally get a delightful, irregular dot pattern.

When transformed into positives, lines and dots, as it were, almost appear to be bodiless, mat and perfectly flat. There is no danger of reflections. If you like you can combine such a screen with a filter by cementing, and use it very much like a filter. Of course, the positives can be made light or dark. The more transparent the net, the less palpable will be its influence in the exposure. The meshes operate more strongly with a long focus than a short focus lens.



MODIFIED SPITZER BULLET AT 3,000 FEET PER SECOND

(Quayle: "Photography of Bullets in Flight.") *Courtesy of The Franklin Institute.*

What this kind of a diffusing screen actually does is this: it breaks up the precision of lines and the harshness of contrasts, and produces a softer transition from one plane of tonal values to another. Further variations of modification can be made by leaving certain parts of the positive plate absolutely blank, either a circular opening in the center or reversing the scheme—showing the network only in the center and leaving the remainder blank. In the same way (for landscape compositions) one-fourth of the upper or lower part may be left blank. A circular patch of network in the center alone will influence the center rays that are always the strongest and apt to expose a plate in the center more than at the margins, but with our later day anastigmats this would mean very little, as they distribute the light quite evenly. Besides the making of a successful screen is quite a task, it cannot be done on the spur of the moment, and for that reason it is best to stick to the one or two that are most suited to one's instrument.

The principal merit of a diffusing screen is that the superimposed design forced the image into a more uniform tone. It should not destroy the freshness and clearness of the original image, but only modify the high-lights and not change the darker passages except in their tonal value. If such a screen exposure does not produce the desired effect, there is no reason why the same screen could not be put into service again in the enlargement.—*Photographische Rundschau.*

THE TONE OF THE PHOTOGRAPH

PHOTOGRAPHY, strictly speaking, is an art reproductive process in monochrome Color-photography, marvelous as the results may be, would not be chosen by the pictorialist as the medium of expression in art. No, he is convinced that there is greater opportunity afforded in the wide latitude of selection presented in the printing media in monochrome, where he may have personal control over the genesis of his picture.

Presupposing, therefore, the necessity of rendering the print in monochrome, the artist naturally seeks to determine which is the most suitable color to exploit his production. There seems to be no consensus of opinion to guide him in this particular province of his art, and judging from the examples presented, it would seem to be a subject not seriously considered.

This disregard for some criterion for selection is not confined to photographic practice. The art illustrator, with brush, works on no constant principle. Turn over the pages of any first-class art publication and look at the monochromes, and you see an indiscriminate use of color, without consideration of the suitability of the tint to the character of the subject, so that it is a rest to the eye of sensitiveness to color valuation to turn to black and white illustrations where, at least, it is not distracted and annoyed by incompatibility of theme and color.

If such practice prevails with color artists who have been educated to the value of harmony, why marvel that motley should rule in photography? We

might suppose that fashion had here some dictation, but it is hardly reasonable to think that an artist would stultify himself by conforming to a fad which militated against his reputation. Or, can the virtues of the reproduction be equally expressed in any color?

We think most of us would not subscribe to such a pronouncement because the fallacy of it could be optically proved; but it does look as if the photographer is a votary to some particular popular fad. Some forty years back there was as little need for discussion, inasmuch as the photographer who affected art had Hobson's choice only, an alternative between brown and blue (albumen and ferro-prussiate paper). He, of course, resorted to the warm tones had with silver-paper and almost universally elected the rich brown possible with it, and we have to confess, it was all the artist could wish for. He could, to be sure, vary a little in the scale to purple and red, but the general choice was warm rich brown, which was denominated "photo-tone."

The softness and beauty of the platinum print attracted at once the artistic worker upon its introduction, and it eventually retired albumen as a medium for pictorial photography. The beautiful, luminous shadows and the modulated high-lights it afforded, when a good negative was used, gave impluse to reproduction in black and white. Bromide paper was introduced a little later and the good blacks it gave with the ferrous-oxalate development, further influenced the taste, but the platinum process being more a direct operation than the bromide printing method, more accurately translated the virtues of the fine negative.

Then came the predilection for sepia tones; and both media catered to the dominant taste

It is not necessary, perhaps, to say that it is possible to give the scale of gradation in tone in any color; but with less trouble in black. Sepia, however, dominated and photographers had to have means for getting the tone directly or by subsequent application. The toning methods, for obvious reasons, prevailed, but in the majority of cases the tones were faulty from want of ability in manipulating the original print. With most workers it amounted to a means of amelioration, a sort of intensification of an imperfect product. The direct sepia method with bromide, which gave most beautiful effect in tone, seemed too tedious for the six-cylinder photographers; and so sulphide toning was introduced with its indifferent sepia tones.

Platinum permitted the production of the sepia tone by a more direct method, and hence a more pleasing character than the roundabout way, which entails uncertainty of desired results.

Black and white seems to, or really does, translate to our vision the tonal value of color, better than any other monochrome. We say "seems to translate" because our faculty of appreciation of these color values, from high to low, may be the result of the education of the eye through training in the study and enjoyment of engraving through many generations, until it has, like other acquired faculties, become a fixed habit. Indeed one instinctively supplies the coloration when observing some of those grand examples of old engravers' art.

But since engraving has become almost a lost art, may we venture that the rising generation, possibly, has no such delight from acute vision in translating into color any of the so-called warm monochromes, like brown and sepia—and we really have to confess that we do see superb examples in such tones, but then it might be that such work would delight us more if we could see it in black and white. In conclusion we might suggest the propriety of consideration of the color tone with reference to the character and motive of the subject.

There might be certain features in a picture at variance with a selected tone, so as to throw the relation of parts out of harmony, at least the color should never register contradiction to actuality.

A sea view, for instance, may logically be printed in black and white, but might be much enhanced in value by exhibition in green or blue-green or grey-green; but it would be an incongruity to print it in red or sepia, yet we have witnessed such.

But if the subject should be an open-landscape, while blue-grey would almost give the natural sky and water, the rest of the picture, trees, rocks and ground would be out of tune, and make the subject discordant and jarring to good taste.

A WORD ON DENSITY

IT demands considerable experience in judging of density of the negative during the operation of development of the plate, so that frequently a wrong estimation is made, even by good workers, and recourse must be had to intensify or reduce the image to have the negative present the proportionate densities in the high-lights and shadows. Two negatives may have seemingly identical densities when looked through, but their printing quality will be found different.

The variable printing value must be due to opacity, hindering light penetration. The difficulty here is further increased when the sensitive surface of the emulsion is in considerable depth of deposit.

There are several ways of getting a desired density, by which we mean a density in the negative which is proportionate throughout. First the photographer may try for as close an approach to it in the development as possible, and then stop further action, if he hesitates to risk results, trusting to building up by intensification to the wanted density, or he may risk by carrying density a little further than one thinks is needful, and cautiously reduce. Both tentative methods are often useful, sometimes even advisable—but it has to be admitted that such methods are not scientific, and that of necessity the control of the photographer is limited and the uncertainty of the various operations great. Hence, the best procedure is to learn how to definitely control density.

In all probability the deposit forming the image in development of the plate is a reduced salt of silver, exposure being proportional to the intensity of the light action upon the salt of silver. In such a produced negative we may

take the gradation as normal and so, if in any way the scale of gradation in a negative be altered, it must be in terms proportional thereto. So we must try for methods by which control of density may be effected, but must not destroy the normal character of the gradation.

The agent employed in getting density begins to act outwardly from the surface—and to get with certainty a normal alteration of density, the changes produced must be such as work thoroughly and directly through the film.

Complete reduction would entirely destroy the image, and if partial reduction is made, the action might be in a measure controlled, if the reducer is diluted sufficiently to be allowed to penetrate the entire film before its action on the image begins, and in a measure act normally, giving proportionate density to the negative. But there is no warranty this will happen.

In like manner we might get normality in intensification, or get it by judicious action of both reducer and intensifier. It remains only to advocate a more certain way without encountering abnormal results, that is, to study in development how to manage the scale of gradation so that it may be exactly translated in the print made from the negative. The scale may seem, in the negative, just what is desirable for our purpose; apparently have the proportionate density, to wit, in the whites of the picture—have a proportionate scale of flesh tones, the tone of the collar and drapery tone, and gradations of shadow. This may all be visible in the negative and yet the print therefrom show none of the differentiation of tone. The reason for this is that the printing media precludes, by its method of action, the securing of this nice modulation.

How shall we accommodate conditions? Simply by not over developing, that is, making the negative go in density beyond the normal. And then by proper printing (slow action) secure the differences. This demands great care, judgment and experience in estimating the proper degree of density. But the results are well worth the expenditure.

Of course, there is remedial agency in careful intensification, if one falls short of the normal, or in reduction if he goes somewhat beyond. But an overdensely developed negative should be disregarded, because reduction of it demands rigorous action, which obliterates the gradation scale. If after-treatment is necessitated, the agents employed must be such as act slowly, such as have chance to permeate the film uniformly before actually beginning operation.

The reason why ammonium persulphate, as a reducer, acts more uniformly, we venture to say, is because it acts after having first permeated the film. This looks more reasonable than the theory that it has preference for first attacking the denser deposit.

Some years back we recommended the increase of the proportion of hypo to the quantity of the ferricyanide in Farmer's reducer, to 5 or 6 fold finding that the action over the whole film was more uniform than when the proportions recommended were followed, and we think the cause is due to the slowing of action due to the dilution effected by excess of hypo.

"MISS WASHINGTON"
(MARGARET GORMAN)

JOHN HOWARD PAINE

"STUDY" JOHN HOWARD PAINE

ACTION OF LIGHT ON SILVER HALIDES — A CONTRIBUTION TO THE STUDY OF THE LATENT IMAGE

THE term "silver halides" is convenient for including the three silver compounds, chloride, bromide and iodide, which are commonly employed in photography. The nature of the impression made by light upon these has been a matter of much investigation and theoretic speculation. A summary of the more important views was given in THE PHOTOGRAPHIC JOURNAL OF AMERICA, for September, 1921. Two theories have been most prominent. One is that the light produces a complete decomposition of a small part of silver salt; the other, that a sub-salt is formed by a loss of a portion of the halogen from some of the molecules. This latter is often quoted as the "sub-halide" theory. Zsigmondy has strongly opposed the latter theory in his book on Colloidal Chemistry. The minute amount of the halogen which is given off under any circumstances has rendered a close study of the changes difficult, but the invention of an extremely delicate balance, known as the Steele-Grant Micro-balance, has enabled further researches into the subject, and E. J. Hartung has carried out, in the laboratory of the University of Melbourne, investigations which seem to show the nature of the effect of light, especially on silver bromide. The balance used permits of the detection of differences of weight of the millionth of a milligram. The sensitive emulsions were prepared on small thin quartz plates, by coating these with pure silver and then exposing to the vapors of bromine. Every precaution that could be suggested was taken to ensure purity of the deposit. Many sources of error were found during the course of the experiments. Thus, it was found that films of silver exposed near to sheets of vulcanized rubber will gain weight although showing no darkening, but the action is in all probability due to the escape of sulphur from the rubber and its union with the silver. Numerous other precautions were required.

The effects of light on silver bromide were studied both in free air and in vacuum. In air, the exposure of the sensitized plate was accompanied at once by a loss of weight, due to escape of bromine. Only a small proportion of the bromine present is lost, because the film is opaque and, therefore, the effect of the light is superficial. The action is attended by a change from pale yellow to pale purple. If the film is then exposed in the dark to bromine vapor, the yellow is restored and the mass resumes about its former weight. It was found that films preserved in the dark remained constant in weight, if care was taken to protect them from contamination. If films partially bromided were used, that is, in which the whole silver surface was not converted into bromide, the loss in weight, even after hours of exposure to sunlight, was inappreciable. From this it seems that the excess of silver took up whatever of the bromine was set free.

The vacuum experiments were quite striking in results. The low pressure caused at once loss in weight, presumably due to the partial removal of the

layer of gases condensed mechanically on the surface, and the exposure to light resulted in a high proportionate loss of bromine. In these experiments, the bromide was almost entirely reduced to free silver. It was further shown that oxygen is not needed for the action, and water vapor is also probably without importance. It follows, therefore, that the oxy-bromide theory is disproved, as is also the sub-halide theory, and support is given to the view that a complete reduction of the bromide to silver occurs with a limited amount of the salt.

A limited number of experiments were carried out with silver chloride and iodide which gave substantially the same results. A further trial was made with ozonized oxygen which showed a loss of bromine in the dark and an acceleration of the loss in the light.

It is probable that if a suitable absorbent for the liberated halogen is present it will be possible to reduce the salt completely. It is not unlikely that in the ordinary case, in which gelatin, collodion or other organic substances are incorporated in the film, these act as absorbent of the liberated halogen, which substitutes some of hydrogen in the molecule. The gelatin (or other colloid) is then definitely changed wherever the light has acted and consequently an image can be obtained even when the emulsion is wholly dissolved by hypo. This would explain the interesting phenomenon of development after fixing, which has been described in a recent issue of this journal.

A research of equal interest will be the investigation of the phenomena attending excessive overexposure, by which the picture is not only completely reversed, but, as Professor Nipper showed a number of years ago, the plate must be developed in the light, or it will be fogged. Attention has been directed unduly to the study of the sensitiveness of silver halides. It would be well if many other salts of this metal were carefully studied, and also the salts of other metals. Recent investigations have shown the sensitiveness of zirconium hypophosphite to light. No close chemical relation exists between silver and zirconium, and, as the latter is not easily reducible to the metallic state, it is not probable that the change in its hypophosphite is analogous to that which occurs when silver salts are affected. Very extensive fields of research, not wholly without promises of practical results, are here opened to the scientist.

Photography of Bullets in Flight.—Reference was made in the May issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA to the valuable and interesting data obtained by the photography of projectiles, and some abstracts were given of a paper that recently appeared in a German journal. A recent issue of the ***Journal of The Franklin Institute*** contains a paper on this subject by Philip P. Quayle, Assistant Physicist of the Bureau of Standards, and by the courtesy of the Institute, several of the photographs are presented on pages 338, 339 and 344.

We have discontinued the monthly supplements—"Materia Photographica"—beginning with this issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA. As there are fully 600 photographic chemicals in the list, it would take too many months to complete the papers—hence we will publish it in book form and endeavor to have it in readiness during the early winter months. Each subscriber on the mailing list of THE PHOTOGRAPHIC JOURNAL OF AMERICA will receive a complete copy gratis.

Dr. Hitchens is at work revising and placing the matter in an up-to-date form, and the book, when it appears, will be complete in every detail.

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Antiquity of the Lens

There is every reason to believe that the ancients were attracted by the phenomenon of pictures of external nature projected upon an interior wall through a small aperture. However, we have no earlier record of such observance than the writing of Aristotle, who speaks of the formation of the round disc of the sun by the passage of rays through a square hole in a wall.

But, prior to Aristotle, we do know the Assyrians knew the magnifying property of a lens of glass, because the British Museum possesses a constructed piece of glass in shape of a lens.

The Babylonians and Assyrians undoubtedly either possessed much sharper vision than ourselves or they made use of a lens in the minute engraving on their seals.

This Assyrian lens is made from a rock crystal and is plano convex. It was found by Layard in his excavations at Nineva and evidently had been chipped to its form and afterwards ground and polished. As it was found together with other objects bearing the name of Sargon, it is possible to approximately fix its date somewhere about 700 B. C.

After testing it Mr. John Mayall pronounced it rather defective on account of the irregular curves in the grinding. Its focus is 4½ inches.

The British Museum, however, has more perfect ancient lenses in the form of two glass bosses, the external form of which is so regular as to reasonably suggest their employment as magnifiers. We do know from historical source that Nero had a large emerald cut in the shape of a lens, which he used as a monocle at the gladiatorial shows.

It has been further stated that the extremely fine engravings of which Pliny speaks of were made without the use of a magnifier. The notion that the practice of photography was known to the ancients cannot be substantiated, but that the lens is of considerable antiquity there is no doubt.

September Meeting of the Technical Photographic and Microscopical Society

An attractive program of papers, addresses and exhibits is in preparation for the annual meeting of the Technical Photographic and Microscopical Society, which is to be held at the Grand Central Palace, New York, in conjunction with the Eighth Annual Exposition of Chemical Industries, on Thursday, September 14, at 2 P. M. Among the special papers and addresses which will be presented are the following:

Miss Eloise Gerry and Dr. E. M. Diemer (Forest Products Laboratory, Madison, Wis.), "Photomicrography in Pulp and Paper Research Problems."

Henry Green (New Jersey Zinc Company, Palmerton, Pa.), "The Photomicroscopy of Paint and Rubber Pigments."

Dominic S. Mungello (Craftsmen's Film Laboratory, New York), "The Finishing of Motion Picture Films."

Clarence W. Gibbs (Victor Animatograph Company, New York), "Mechanics of Motion Picture Apparatus."

Alfred B. Hitchins, Ph.D., F.C.S., (Director, Ansco Research Laboratory, Ansco Research Laboratory, Ansco Company, Binghamton, N. Y.), "The Motion Picture as an Aid to Industry."

Guido E. Daub (A. F. Gallun Sons Company, Milwaukee, Wis.), "Microscopy in Leather Tanning."

Albert H. Grimshaw (Textile School, New Bedford, Mass.), "Use of Microscope in the Textile School."

Philip O. Gravelle (South Orange, N. J.), "Protozoa and Rotifiers—Studies in Microscopic Animal Life." Illustrated with Motion Pictures.

Several of the firms in membership will contribute specimens of their work with photography and microscopy. Among them will be photomicrographic reproductions or pictures of textiles, showing defects in material, etc., as well as pictures of machines on which textile tests are made.

Photomicrographs of paper fibers will also be exhibited to show the composition of various papers.

The use of motion picture cameras in studying the form and character of water masses thrown up by under-water explosions presents a very interesting and beautiful series of photographs, which will be lent by the Bureau of Ordnance of the U. S. Navy.

In addition to the photographs, which will constitute the major part of the exhibit, arrangements have been made for the display of several unique devices designed for work in connection with photography or applying some phase of photography or microscopy to novel purposes.

The importance of the microscope in studying the constitution of various substances will be exemplified by a section devoted to the investigation of the structure of coal. This includes photomicrographs of very thin sections of coal, which throw light on the constitution of the fuel. Other specimens along this general line will include photomicrographs showing the causes of failure in materials and determination of the quality of raw materials by means of the microscope.

Several of the departments of the various government technical bureaus have consented to contribute specimens of their work with photography and photomicrography. Among the most interesting of these are photographs showing the explosion of black powder and permissible explosives. The pictures were made in connection with the work of the Pittsburgh Experimental Station of the Bureau of Mines.

Arrangements are being made for the inclusion of other ingenious devices and photographs, none of which will in any way duplicate the exhibits of other exhibitors.

An interesting example of the application of photography to accident prevention is an exhibit showing the proper application of first aid dressings.

Improvement of Undertimed Negatives

Most undertimed negatives are properly consigned to the rubbish heap, but it may happen that no means are available for exposing again, so as to make amends for our error. Where such a duty is imposed upon us, we try by every possible method advertised to better the conditions of the negative, so that it may give something at least presentable to our client to appease his wrath.

Most of the methods, however, are makeshifts, and all concerned in the affair are dissatisfied. We sought for a method of improvement, which might make the defective negative approximately nearer the appearance of a good exposure. We tried upon a worthless subject in a positive sense of very negative character, where the shadows in the print from it, under the best methods of printing, were mere blank blackness and the high lights the only parts really printable. Violent contrast of light and shade characterized the negative.

This is the way we succeeded in getting a real good negative from a really bad one.

You have heard of the particular virtues of the ammonium per-sulphate. How it attacks first the high lights in reduction before it tackles the shadows. Now this is just the advantage we want to take of its kind behavior in this particular. We want to get our inordinate high lights down to a proper relation with the shadows to reduce the violent contrast. Use the per-sulphate of ammonium and you will find its action increased by addition of a little free sulphuric acid to the solution. Watch carefully the action, and when the high lights are pulled down to proper degree, it is time to stop the reduction, and put your plate in a bath of sodium sulphite for 5 minutes, then wash well for half an hour and dry. Now the next thing to do is to get as slow an emulsion plate as you possibly can, and use it as a contact with the reduced negative to get a positive therefrom. Put the two surfaces in contact in an ordinary printing frame and expose to a gas jet or flash in daylight. Here you must not undertime, but try to get full adequate exposure.

Success depends on getting the proper kind of positive. If your exposure has been correct and your development proper, you will get a positive in which the relations of light and shade are more harmonious, but a little thin in quality. We must trust to you having got full exposure, not over exposure. We can direct you then how to proceed in the development. Use any ordinary developer, but our preference here is for pyro, because it preserves the shadows best. Develop until the shadows slightly cast over. Do not try to get a brilliant-looking positive just yet. Wash, fix and dry as usual. Look over the positive and spot out and retouch where it needs it. This is easier to do with a posi-

tive than a negative, because in it you do not have a light and shadow reversed.

Now we are prepared for the reproduction of our negative.

Make it by contact as before, or if you want to you may enlarge in a camera in the usual way. Give here also full time, but not excessive time, and develop with hydroquinone and eikonogen in preference to pyro and add a little bromide to the developer, but don't be excessive in its use. After sufficient intensity is secured, wash off thoroughly all developer and place for a few minutes in weak citric acid solution. Don't fix yet till we tell you. After the proper density is had, you are ready for the next operation of building up the negative to good printing density. Make up the following:

Bi-Chloride of Mercury..	120 gr.
Chloride of Ammonium..	120 gr.
Citric Acid	120 gr.
Water	16 oz.

Place your unfixed plate in this and rock the tray. You will notice that the image bleaches out. Let it go to the limit. Sometimes it does not disappear entirely, and nothing will induce it to do so.

If you find, say after 10 minutes, the image still persists, stop, wash off for half an hour under the tap, for it is most important to get all uncombined mercury out of the film before you put it in the hypo—the next thing to do.

Use an ordinary hypo bath, but add some sulphite of soda to it or a little ammonia. The hypo restores the image and you will find that you now have a real good, apparently well-timed negative in place of the worthless progenitor of it.

The philosophy of this method is briefly this, for we love to discover the why and wherefore of things, the reproduced plate after its development and before it has been reduced in the fixing bath has a good rich body for the intensifier to work upon. Finally wash and dry.

Toning with Tin Salts

About a year ago, in the course of some chemical researches upon the organic compounds of tin involving the use of alkaline stannite solutions, it was observed that when these stannite solutions were warmed a change occurred causing the deposition of a gray precipitate. On examination, this precipitate was found to be metallic tin. The reaction which took place when a solution of sodium hydrogen stannite, for instance, was heated may be represented by the equation:—

$$2NaHSnO_2 = Na_2O_3 + Sn + H_2O.$$

Thus sodium stannate should be produced at the same time. On testing the alkaline filtrate after removing the metal this was found to be the case.

Since sodium hydrogen stannite, made by treating stannous chloride with excess of caustic soda solution, is also a strong reducing agent, it was at once thought that this deposition of a finely divided tin precipitate might be of service in various toning processes, and extensive investigations have been carried out both with the view of producing pleasant tones on bromide prints and with the object of elucidating the nature of the chemical reactions which take place in these processes.

The appearance of a fairly exhaustive article on "Colloid Silver Toning with Tin Salts," by Dr. F. Formstecher, in *Photographische Rundschau*, 1921—an excellent account of which appeared in the *B. J.* for December 23, 1921—tempted the present writer to discontinue these investigations. But, as the subject is of considerable theoretical importance and adds something to the results obtained by Dr. Formstecher and also by Miss Woolley and Mr. Gamble, described in the *B. J.*, 1913 December 26, since quantitative experiments have been made, it is considered of sufficient importance and interest to place on record the results that have been obtained.

From the pictorial viewpoint pleasing tones can undoubtedly be produced by toning with stannous compounds, but there is some difficulty in obtaining uniform results, and ordinary sulphide toning is much simpler to carry out and gives uniform and certain results. Nevertheless, tin toning merits consideration.

For toning the bromide prints were first bleached with the ferricyanide solution recommended in the *B. J. Almanac*. Other bleaching agents, *e.g.*, mercuric chloride and copper chloride solutions, did not give such good results unless considerably more care and trouble were taken.

In all cases the black deposit of silver is converted into an insoluble silver salt. Thus with the bleaching solution recommended the metallic image was converted into white silver ferrocyanide:—

$$4Ag + 4K_3FeC_6N_6 = Ag_4FeC_6N_6 + 3K_4FeC_6N_6.$$

That this is the case was proved by exposing some precipitated silver chloride to the light and converting it into silver by ordi-

nary development. The residue of silver was collected, washed free from all traces of developer, and then treated with potassium ferricyanide bleaching solution, which thereby became pale yellow, whilst the silver was changed to a white precipitate. The solution was filtered off and gave the usual reactions for potassium ferrocyanide, which were not given by the original ferricyanide solution.

In a typical quantitative experiment 0.1765 gram of exposed silver chloride gave 0.1094 gram of silver by development Excess of potassium ferricyanide converted this into 0.1803 gram silver ferrocyanide. Treatment with sodium hydrogen stannite solution and subsequent washing and drying yielded 0.1130 gram of silver. These figures satisfactorily indicate that the reactions which take place follow the course outlined.

Further, when silver nitrate solution was treated with potassium ferrocyanide a white precipitate (of silver ferrocyanide) was produced, whereas when treated with potassium ferricyanide the silver nitrate gave a reddish brown precipitate (of silver ferricyanide).

To obtain the warm brown tones from the bleached prints these were then immersed in a bath of the alkaline stannite, when the image reappeared. The tin toning bath was made by dissolving 10 grams of sodium hydrate in 100 c.cs. of water. This solution was slowly added to the cloudy solution obtained by stirring 10 grams of stannous chloride crystals into 100 c.cs. of water, until the precipitate first formed re-dissolved; 100 c.cs. of water was then added. After standing, the clear solution was decanted off and contained approximately 2.5 per cent. of sodium hydrogen stannite, formed according to the equation:—

$$SnCl_2 + 3NaOH = NaHSnO_2 + 2NaCl + H_2O + H_2O.$$

It has been shown elsewhere that even when excess of alkali is used normal sodium stannite, $Na_2\ Sn\ O_2$ is not produced.

For photographic purposes it was found advantageous to dilute this solution still further and use a 0.5 per cent. solution of the stannite, although at this dilution hydrolysis became apparent, since a white flocculent precipitate began to separate.

The chemical aspect of this toning process was investigated by treating the washed silver ferrocyanide, obtained as described above, with the alkaline stannite solution. This reduced it again to tin, sodium ferrocyanide and stannate being formed simultaneously according to the equation:—

$$Ag_4FeC_6N_6 + 2NaHSnO_2 + 6NaOH = 4Ag + Na_4FeC_6N_6 + 2Na_2SnO_3 + 4H_2O.$$

The dark insoluble residue produced in this reaction was filtered off and thoroughly washed to remove the sodium salts. It was quite insoluble in hydrochloric acid, but dissolved readily in dilute nitric acid to a clear solution. Addition of hydrochloric acid to this solution gave a white precipitate (of silver chloride).

When this treatment was carried out quantitatively it was found that 0.1513 gram of the residue (silver), when dissolved in nitric acid and converted into the chloride with hydrochloric acid, gave 0.2009 gram of silver chloride. This corresponded closely with the calculated amount to be obtained from 0.1513 gram of pure silver.

It is thus established that this toning process with tin leaves an image of silver, whilst toning with sodium or ammonium sulphides converts the white silver salt (obtained by bleaching) into silver sulphide, *e.g.:*

$$Ag_4FeC_6N_6 + 2Na_2S = 2Ag_2S + Na_4FeC_6N_6.$$

Experimentally 0.1490 gram of silver ferrocyanide gave 0.1148 gram of silver sulphide on treatment with excess of a dilute solution of ammonium sulphide.

From the technical standpoint initial failures in this method of toning were largely due, strange as it may seem, to the thorough washing of the prints. This entirely removed the sodium stannate and any metastannic acid, H_2SnO_3, which would result through the hydrolysis of sodium stannate on addition of water. Since colloidal silver absorbs the meta-stannic acid, producing a warm tone, it is advisable to simply remove excess of the alkaline tin solution by rinsing and allow the imperfectly washed print to dry.

The effect of subsequent immersion of the print in sulphide toning baths was tried, but did not appear to have any marked influence upon the final tone.

It is of interest to note that the alkaline stannite solution is able to reduce silver chloride to silver, which it does, whether this substance has been exposed to light or not. The reaction may be expressed:

$$2AgCl + NaHSnO_2 + 3NaOH = 2Ag + 2NaCl + Na_2SnO_3 + 2H_2O.$$

Lead is a metal which shows some chemical resemblances towards tin, and, since it is used in certain photographic processes, it was thought of interest to see if it could

also be used for toning in alkaline solutions in the same manner as tin. Entirely negative results were obtained, however, using a solution of sodium hydrogen plumbite, $NaHPbO_2$, prepared from lead acetate solution and excess of sodium hydrate solution.

In his article Dr. Formstecher described various tin-toning baths and sometimes carried out the process in two stages, using an alkali bath and one of stannous chloride. He also states that a bath of "tin salts" containing a little ammonia was suitable, and, unlike more acid solutions, has no eating-out effect on matt-albumen prints. The formula he ascribes to his "tin salts" is $Na_2SnCl_6H_2O$, but as the present writer has shown, sodium stannichloride has the formula $Na_2SnCl_6 6H_2O$.

Instead of using ordinary crystalline stannous chloride, $SnCl_2 2H_2O$, the more stable potassium or ammonium stannochloride was substituted for it in some experiments without any adverse effects being noticed.—J. G. F. DRUCE, M.Sc., A.I.C., in the *British Journal of Photography*.

Silvering Mirrors

EDWARD S. KING

The method described below is a modification of Lundin's process as developed in experiments made by my son, Everett, who died in 1917. These experiments were made by him when a lad of sixteen years during the summer of 1912. He found that the original formula contained an excess of formaldehyde, so that if the silver nitrate was doubled, a much thicker coat could be obtained. As he remarked, a thick coat of silver stands burnishing better and lasts longer. The chief point he discovered was in regard to the temperature. He found from his experiments, which were carefully recorded with all particulars, that the absolute temperature, within reasonable limits, did not make much difference; but if the mirror was about 10° to 20° Fahrenheit warmer than the silvering solution, a thicker coat resulted and the process was more reliable. Some have thought that the stannous chloride used in the Lundin process acts on the surface of the mirror. If it is washed off thoroughly enough to prevent chloride stains on the silver deposit, it seems that no other effect can be possible.

The burnishing of the mirror is of utmost importance. He found by experiment that the average reflectivity of four unburnished mirrors tested was photographically about 58 per cent, against an average of 78 per cent when burnished. The mean of 13 tests gave a reflectivity of 83 per cent after burnishing. The best coat obtained reflected 90 per cent of the photographic light. I enclose a print showing our 24-inch mirror after he had burnished one-half of it. The directions, which follow, were prepared by him and are now in use in this observatory. For silvering a 24-inch mirror it requires about two litres of solution or 20 times the formula.

DIRECTIONS FOR SILVERING MIRRORS

First a saturated solution of stannous chloride is made up, and diluted for use with an equal volume of water. Several wads of clean absorbent cotton are laid out on a clean sheet of paper. The surface of the mirror is carefully rubbed with one of the wads dipped in nitric acid. This removes the old coat of silver, with all the dirt which may be adhering.

After thoroughly washing off the nitric acid, a fresh wad of cotton wet with the stannous chloride solution is rubbed over every part of the surface of the mirror. Water is then poured over the mirror, and the surface is rubbed, first, with the same wad, and then with a fresh one. Great care should be taken to remove all traces of the stannous chloride, as, if any is left on, it makes the coat granular. One should be careful not to touch the surface with the fingers, as any trace of grease is fatal.

The mirror, if a small one, may then be placed in a tray just a little larger than itself, and covered with water, at temperature from 65° to 70° F. If a large mirror, a band of waxed paper, tied tightly around the edges, makes a dam and serves the same purpose.

Two solutions are required as follows:

A.	Water	100 cc.
	Silver Nitrate	4.3 g.
	Add strong ammonia just sufficient to redissolve the precipitate first formed.	
B.	Water	20 cc.
	Formaldehyde (Merck)	4 cc.

The temperature of these solutions should be about 45° and 50° F.

The wash water is then poured off the mirror, the solutions quickly mixed and poured over the mirror. Silver will begin to be formed on the surface of the glass almost at once, the solution turning to a red brown color. In about half a minute, the solution begins to turn muddy, with a granular black precipitate. The mirror should be left in it until this precipitate

begins to stick to its surface. This usually requires from three to five minutes. The mirror is then washed with wet cotton and flowing water, and set on edge to dry.

It is important to get as thick a coat as possible, for such a coat stands burnishing better and lasts longer. The thickness can be roughly estimated by observing the amount of light transmitted by it. An electric light filament can barely be seen through a thick coat.

The burnishing is done with a pad of chamois skin, into which some very fine rouge is worked. The best rouge is that washed out from the cloths used after the final polishing in the making of a large lens. The rouge is only sufficient to color the pad. The surface of the pad must be kept perfectly free from dust, or the delicate surface of the silver will be scratched. —*Popular Astronomy.*

Extra-Sensitizing of Autochrome Plates

[Considerable interest has been aroused in France by the publication in the *Bulletin* of the French Photographic Society of a note by M. F. Monpillard, deposited with the Society in a sealed packet in January, 1913, describing a method of obtaining greatly increased sensitiveness, up to thirty times, of autochrome plates. M. Monpillard's communication has been followed by a paper on the practical employment of the method by M. L. Gimpel, who was a collaborator, in the use of the extra-sensitized plates. The following is a translation of the two communications printed in the *British Journal of Photography.*]

M. MONPILLARD'S NOTE OF 1913

The first experiments relating to the method described in the present note, which has been written for purposes of claiming priority, date from November, 1911. In view of the fact that most of the formulæ for solutions used in orthochromatizing or panchromatizing plates contain ammonia, I formed a theory that the effect of this ammonia was to dissolve a minute proportion of the silver haloid in an emulsion, and thus to facilitate the combination of the silver haloid with the color sensitizer so as to give sensitiveness to certain rays of the spectrum.

This hypothesis of a combination between the silver and the dye is quite in accordance with observed facts. An aqueous solution of eosine can be precipitated by a soluble silver salt, the resulting colored precipitate being soluble in ammonia.

Starting from this hypothesis it occurred to me that the general and color sensitiveness of a photographic preparation could be augmented by means of an orthochromatizing bath containing sensitizing dyes combined with a suitable silver salt. In the first instance I turned to combinations of silver with chlorine, bromine and iodine, and my first experiments were made with silver chloride, chosen on account of its special solubility in ammonia.

The first experiment on these lines showed me that a very considerable increase in the general sensitiveness is produced by the presence of a very minute quantity of silver chloride in the color-sensitizing bath. At this time (November, 1912) M. Simmen confirmed this result experimentally.

By a series of systematic experiments I then determined, for the special case of the extra-sensitizing of autochrom plates, the best proportion of silver chloride for addition to the color-sensitizing dyes in order to obtain the maximum effect without risk of fog. Under these conditions it was found that the sensitiveness attained by an autochrom plate is thirty times that which it possessed before treatment. On the other hand, experiments showed that this sensitiveness is preserved for at least thirty-two hours, and that no fog is produced even when this period elapses between the treatment of the plate and its development after exposure. At the same time absence of fog is conditional upon the quickness with which the plate is freed from the sensitizing solution and is subsequently dried.

Experiments were successfully made with acetate of soda, also with silver potassium cyanide, in all cases in ammonia solution. The last-named double salt does not permit of the sensitiveness being increased so greatly as with silver chloride. Silver citrate possesses little advantage, and silver acetate gives fog. In an experiment made on January 12, 1913, the use of colloidal silver solution instead of silver chloride appeared to give interesting results.

On the whole, while silver bromide and silver iodide in the presence of certain color sensitizers conferred greater sensitiveness to certain rays than does silver chloride, the insolubility of silver bromide in ammonia and the very slight solubility of silver iodide in the same solution showed

me that it is not practicable to employ these compounds in place of silver chloride or to use them in conjunction with silver chloride in color sensitizing baths. It occurred to me, however, to add a soluble bromide or iodide to the ammonia solution of silver chloride in the hope that a reaction would be reduced in the sensitive film and that bromide and iodide of silver would thus be combined with the color-sensitizing dyes. Nevertheless, experiments showed that the addition of any soluble bromide, producing a precipitate in presence of silver chloride, was useless. On the other hand, addition of solutions of ammonium iodide, zinc iodide, or cadmium iodide, is possible within limits. The first experiments showed that a considerable increase of sensitiveness can be produced in the gelatino-bromide emulsion by this means.

In concluding this note I will add that my laboratory tests having interested our member, M. L. Gimpel, the latter has rendered me the help of his wide experience in the practical use of the results which have been obtained, and I have to thank him for the very valuable assistance which he has given, and continues to give.—F. MONPILLARD.

P.S.—Applying this method to the treatment of plates for ordinary monochrome photography M. Gimpel has been able to make night photographs with relatively very short exposures under the ordinary lighting used in Paris.

INSTANTANEOUS EXPOSURES ON AUTOCHROM PLATES

[The following is the paper by M. L Gimpel to which reference has already been made. We are indebted to the French Photographic Society for permission to make the translation from the Society's *Bulletin*. —*Ed. B. J. of P.*]

I must first express my deep regret that M. Monpillard, owing to his distance from Paris, is not able himself to make this communication with the clearness and ability which the Society has so frequently had the opportunity to appreciate.

As is well known, the autochrom plate has a sensitiveness which is from 1-50th to 1-60th that of an ordinary rapid plate, such as the Lumière "Blue Label," employed in monochrome photography. This low degree of sensitiveness arises largely from the absorption of light by the colored starch grain and by the compensating light-filter, and renders it impracticable to give instantaneous exposures except under the two following exceptional conditions:—

(1) Marine subjects, which, owing to the great actinic strength of the light, can be taken at speeds ranging from 1-5th to 1-10th of a second with a lens working at about *f*4.

(2) Exposures from a balloon. These may be taken at about the same speed, provided that the angular movement of the balloon is very small. I made the first of such exposures in the year 1898 at an elevation of several hundred metres above St. Leu-Taveny and Falmondois.

It was natural that the idea should occur to certain workers on increasing the sensitiveness of autochrom plates sufficiently to permit of instantaneous exposures. One of our members, M. Simmen, showed for the first time at a meeting of the Scientific section on June 14, 1910, and afterwards at the general meeting on July 8 of the same year the result of his work in this direction. By combining the color-sensitizing, dyes, pinachrome, pinaverdol and pinacyanol in weak alcoholic solution without addition of ammonia, M. Simmen devised a hyper-sensitizing bath in which, by immersion for a few minutes, followed by rapid drying, the plate was rendered four or five times as sensitive.

The increase of sensitiveness, specially for the less refrangible rays of the spectrum required the modification of the light-filter which M. Simmen prepared at first solely with æsculine; that is to say, a colorless filter absorbing only the ultra-violet rays. The plates could be kept before development for about three weeks.

M. Simmen's communication was accompanied by the projection of a number of transparencies which created much interest, although the colors of some scenes were not rendered quite satisfactory. Afterwards, when the process had been worked out, M. Monpillard showed us that hyper-sensitizing favors the reproduction of some colors; violets and purples, which the autochrom plate in the ordinary way does not always reproduce correctly, are rendered with great fidelity on the hyper-sensitized plates.

At a meeting of the Society on November 18, 1910, M. Emile Vallot, well known for his work in three-color photography, presented a hyper-sensitized autochrom taken at Luna Park, Neuilly, showing perfectly the life and color of this thoroughfare. M. Vallot explained that he had simply used the Simmen process, with very

slight modification of the proportion of the dyes and with introduction of a little yellow into the light-filter.

The results obtained by M. Vallot prompted me to make some experiments, and my first hyper-sensitized autochroms were made on December 28, 1910, with plates which M. Simmen had sensitized for me. M. Vallot also very kindly gave me all the details of his method of working, and laid particular stress on the use of a whirler for removing surplus sensitizing solution from the plates in order to dry them as rapidly as possible. M. Vallot stated that his sensitizing formula was somewhat inferior to that of M. Simmen, inasmuch as the plates did not keep quite so long, but experience showed me that by taking suitable means for rapid drying they could be kept for more than a month.

Another experimenter, M. Thovert, used a single sensitizing dye, namely, pinachrome, the employment of which allowed of the use of the light-filter which could be purchased in the ordinary way, namely, that made by MM. Lumière for the reproduction of autochroms by magnesium light. Other contributions to the practice of hyper-sensitizing were also made by M. Palocsay and M. Jové; and on March 15, 1912, M. Adrien showed a very simple apparatus by which any amateur could easily hyper-sensitize his plates. This device, coupled with the sale of the sensitizing solution by MM. Poulene, ready for use and standardized by M. Monpillard, should have extended the use of this method among autochrom workers, but, unfortunately, little interest is taken in it.

Towards the end of 1911, or beginning of 1912, M. Monpillard, knowing that I was interested in instantaneous color-photography, particularly in my work on *L'Illustration*, told me that he was experimenting with a new process of hyper-sensitizing, and that the first laboratory tests had given results, as regards increased sensitiveness, which he had never hoped for; further measurements showed that the sensitiveness was increased thirty times. I anxiously awaited information concerning the method, but my first subsequent meeting with M. Monpillard was a great disappointment. M. Monpillard told me that his idea had no practical interest, since the plates had to be used at once, their preservation in working condition being a matter of hours. While admitting this drawback, I pointed out to M. Monpillard that there were many occasions on which the process could be used. However, M. Monpillard held to his view, and we did not discuss the process until November, 1912. M. Monpillard then said that he wished me to study the practical use of his process, which latter he had described in a memorandum deposited as a sealed packet at the French Photographic Society on January 17, 1913.

In the course of my experiments, ranging from November, 1912, to July, 1919, we tried the compensating light-filters most suitable for correct rendering of colors in daylight and by incandescent and arc electric lamps, since these latter were used in the theatres. M. Monpillard worked out twenty-six different light-filters which I tried in the workroom, out of doors, and at the theatres. We used 320 plates in these tests and in our experiments, made for the purpose of improving the keeping properties of these ultra-sensitized plates. I use the word "ultra-sensitized" to distinguish the process from that (hyper-sensitizing) in which a lesser increase in sensitiveness was produced. M. Monpillard, being unable to continue the work which we had undertaken for the purpose of perfecting the process, decided at length to publish the contents of his sealed memorandum, as was done at the meeting of the Society on March 24 last. He did so with the hope that other experimenters would succeed where we had failed. When the note was read some dissatisfaction was expressed that it did not contain the sensitizing formula which was used. I can now remedy that deficiency. The difference between ultra-sensitizing and hyper-sensitizing consists simply in the addition, at the time of use, of a small quantity of silver chloride dissolved in ammonia to the mixture of the sensitizing dyes. The following are the stock solutions of the dyes:

A.	Pinaverdol............	1 gm.
	Alcohol, 90 deg.........	1,000 c.c.s.
B.	Pinachrome.............	0.05 gm.
	Alcohol, 90 deg.........	1,000 c.c.s.
C.	Pinacyanol..............	0.05 gm.
	Alcohol, 90 deg.........	1,000 c.c.s.

Solution D.

Stock solution A.......	100 c.c.s.
Stock solution B.......	100 c.c.s.
Stock solution C.......	47 c.c.s.

According to theory, 56.4 c.c.s. of the C solution should be required.

It must be understood that the latter

figures are approximate. Before the war two different makes of sensitizing dyes showed variations which required the composition of the mixed sensitizing solution to be adjusted. Since the war the variations are greater, since dyes are not manufactured with such care and also because there are differences between those sold in Germany and those which are exported.

E.—Concentrated Sensitizing Solution

Solution D	400 c.c.s.
Alcohol, 90 deg	600 c.c.s.

F.—Silver Chloride Solution.

Water, distilled	92 c.c.s.
Ammonia, 22 deg	8 c.c.s.
Silver chloride	0.2 gm.

G.—Working Sensitizing Solution

Solution E	10 c.c.s.
Solution F	10 c.c.s.
Alcohol, 22.5 deg	80 c.c.s.

As regards working methods, it is most essential to provide the means for drying the plate with the greatest possible speed. I think M. Vallot was the first to recommend a whirler for drying. There are, as you know, several patterns. I do not recommend the ordinary dark-room whirler, actuated by an endless screw, since the wear on the teeth is very rapid. The band type is certainly better, but on the whole my preference is for the water-motor pattern, which is rotated at the rate of 1,500 revolutions per minute with small consumption of water.

M. Vallot uses a grooved tank for the sensitizing bath, and provides it with a capillary outlet, so that the solution drains away very slowly and completely, the plates being perfectly free from adhering liquid when they are removed. On no account must a metal dish or tank of any description be used for a sensitizing solution containing the silver chloride. Glass or glazed earthenware must be employed.

For drying, an electric fan, delivering ample quantities of air into the grooved box in which the plates are arranged, is a necessity.

As regards dark-room illumination, in ordinary autochrom work I use a lamp containing a carbon filament bulb of 5 c.p., provided with one yellow and two green Virida papers. For ultra-sensitizing, I fold my Virida papers around a sheet of cathedral green glass and arrange the lamp so as to carry on the operations in shadow.

Sensitizing should be done at a low temperature. In summer I make up a cooling mixture of ammonium nitrate and water, standing the glass dish containing the sensitizing solution in this mixture. Having carefully dusted the first autochrom plate, it is immersed in the sensitizing bath and the stop watch started. At the end of three minutes the plate is quickly replaced by a second, and the first plate deftly placed upon the platform of the water whirler. After about a minute the water is stopped, and the surface-dried plate placed in an electric drying box. By working in this way no time is lost. If a box of four plates is being sensitized, by the time the fourth is put into the drying cupboard the first will be ready for insertion in the plateholder. This means that the first will have occupied about ten minutes in preparation, but it is practically certain that it will have been dry at the end of three or four minutes.

I do not recommend strengthening of the sensitizing bath, as some workers have suggested. I prefer to use 100 c.c.s. for sensitizing six 9 x 12 cm. plates and then to throw it away.

Exposures have been made with the *f*4 Lacour-Berthiot anastigmat fitted with the J. H. light-filter prepared by M. Monpillard for plates either hyper- or ultra-sensitized. While I am not particularly fond of the focal-plane shutter, I admit that for our special purpose of obtaining the greatest action of light its high efficiency is an advantage.

Development is important. M. Adrien has shown us some remarkable autochroms made on hyper-sensitized plates and developed with pyro. But they were not instantaneous exposures, and pyro is the most unsuitable developer for autochrom plates which have not been fully exposed. Some recent experiments made by Le Comte de Dalmas have shown that, as compared with pyro, one-third the exposure may be given if the plates are developed with metoquinone. I, therefore, use this developer in double strength, *i.e.*, 40 parts per 100, instead of 20 parts per 100, as recommended by M. Vallot.

Development should be done with as little delay as possible, since the ultra-sensitized plates keep for a very short time, and, moreover, this time varies considerably. The longest period which I have allowed to elapse, whilst still obtaining a satisfactory result, was 43½ hours, but it is well to develop, at any rate, within twelve to twenty-four hours of the plates being sensitized. I have tried many means for prolonging the preservation of the

ultra-sensitized plates, such as keeping them under mercury, varnishing the film, immersion in carbonic acid or nitrogen, but all without result.

M. Monpillard and I made some experiments on the advantage of backing the ultra-sensitized plate with a white instead of a black card, as recommended by M. L. Benoist in 1910. Workroom tests on ordinary autochroms showed that exposure could be reduced to about two-thirds by this means, but when we tried this method on the ultra-sensitized plates it failed completely. By courtesy of M. Lucien Guitry we made a series of exposures from a good place in the theatre on scenes in the play "Kismet," the ultra-sensitized plates being backed with white cards which had been kept in the dark for several days previously. On development not a trace of image was obtained on any of the plates. On the next day a new series of exposures were made on plates backed with black cards, with complete success. Shortly afterwards some tests were made by backing the plates with silvered copper plates, as used in the Daguerreotype process, but no difference could be found between these results and those made under the same conditions, except that the plates were backed with black cards. I mention these contradictory experiences without being able to explain them. Possibly the effect of the white card is simply to produce an initial change in the sensitive film; in the case of the ultra-sensitized plate this change perhaps proceeds altogether too far.

Here I should mention also a phenomenon, the cause of which we have been unable to ascertain. Some of our autochroms have shown pinkish mottling of greater or less depth. In some cases this defect, which is encountered also with hyper-sensitized plates, shows over areas which have soft vignetted edges, whilst in others the markings are well defined and resemble the patches produced by the use of developer in quantity insufficient to cover the plate.

Some of our results have been obtained from aeroplanes. By permission of M. Maurice Farman I made twenty-two flights, but from causes which I could never discover failed to obtain a single good autochrom on the ultra-sensitized plates. I have one passable result, made at about 200 metres in November, 1916, with an exposure of 1-70th of a second. The only satisfactory results were obtained by the hyper-sensitizing process. With the help of the skill of the airman, who drove his machine against the wind at reduced speed, and with luck in dodging the roll of the machine at the moment of exposure, I made the first two autochroms obtained from aeroplanes in May, 1917, with an exposure of 1-45th of a second at *f*4.—L. GIMPEL.

Combined Amidol and Pyro Developer

Amidol, which develops in acid or neutral solutions, and produces fog in alkaline solution, seems at first not to be susceptible of combination with developers that require the alkaline condition. Bunel details, in *Photo-Revue*, some experiments in this line. If a small amount of amidol is added to a pyro developer, fogging will at once occur if the ordinary plate is used, but if a small amount of pyro is added to a neutral solution of amidol, a marked increase in rapidity of development is noted and no fogging results. The solution may be made as follows:

Amidol	0.1 gram
Sodium sulphite (dry)	4.0 grams
Pyro	1.0 gram
Water	100.0 c. c. m.

Pyro will act in the presence of sulphite only, but with extreme slowness; combined with amidol it acquires the remarkable property—not heretofore indicated—of acting rapidly in neutral solution. Further, the addition of a small amount—say 1 gram of metabisulphite to the above bath, gives a potential acidity to it. In such a bath pyro would not act alone, but the presence of amidol makes the pyro active, and if the proportion of metabisulphite is increased, the development goes on first in the depth of the emulsion, so that it can be watched more satisfactorily from the back than from the front of the plate.

What happens if the bath is made alkaline? Great caution is needed in this condition. Pyro is known to the chemist now as pyrogallol; the old name, pyrogallic acid, is misleading. The scientific name indicates that the compound contains at least one group of atoms analogous to that in common alcohol. These groups have a sort of effect in neutralizing sodium hydroxide, and if, to the above bath, we add the full amount of such hydroxide necessary to saturate the pyro, immediate fogging will occur, but if we add only one-third such amount, a rapid and powerful developer is obtained, especially suitable for under-exposed plates. Bunel, however,

advises against sodium hydroxide, and gives the following formulas:

Water	200	c. c.
Sodium sulphite (dry)	40	grams
Amidol	1	gram
Potassium bromide	0.5	gram
Lactic acid (sp. gr. 1.22)	1	c. c.

This is a stock solution which keeps well:

For use, take of the stock solution	25	c. c.
Pyro	1	gram
Water	100	c. c.

This gives the neutral bath. For the acid bath, take

Stock solution	25	c. c.
Pyro	1	gram
Potassium metabisulphite	1	gram
Water	100	c. c.

For the alkaline bath, take

Stock solution	25	c. c.
Pyro	1	gram
Acetone	5	c. c.
Potassium bromide	0.5	gram
Water	100	c. c.

Bunel states that the pyro may be measured out with the "classical mustard spoon."

For over-exposed plates or those about which the exposure is uncertain, use the acid bath. For plates considered under-exposed, use the alkaline one. The neutral bath is best for normal exposure, for papers and for transparencies.

Bunel points out that these data indicate an interesting, unexplored field in photographic development.

Paris Notes

SCIENTIFIC PHOTOGRAPHY

At the exhibition of the Physical Society M. Prédhumeau showed his apparatus for stereo-photo-topography already described in these notes. The well-known instrument maker, M. A. Jobin showed the micro-photometer of Fabary and Buisson for the measurement of densities in photographic negatives, especially for the study of the distribution of light in spectral rays; also a universal photometer by the same designers for measuring stellar negatives or negatives to be used in photo-topography. M. E. Bouty, a maker of astronomical instruments, exhibited a new model of machine for the measurement of multiple movements with great exactitude. Lastly, MM. H. Calmels showed some new grating *replicas* of large size cast from an original *Roland* grating by a Parisian astronomer, M. E. Annequin, for the construction of spectrographic cameras used in the examination of light-filters and in measurements of the color-sensitiveness of emulsions. In addition to these scientific instruments, the exhibition included Eastman Duplitized X-ray film, Wratten light-filters, Guilleminot plates and papers and stereoscopic cameras of Jules Richard.

CINEMATOGRAPHY AND PROJECTION

For some months past there has been a very active propaganda in France for the wider use of the cinematograph in schools of all degrees and particularly in those for young children. The movement has already borne fruit, for several municipalities have acquired cinematograph outfits for us in schools. The town of St. Etienne (Loire) has provided each of its schools with a cinematography projection outfit. Films for these purposes are obtainable on free loan from a department of the Ministry of Public Instruction, which for many years past has circulated collections of ordinary lantern slides throughout France. Not only is the loan of these films made without charge, but the films are sent here and there gratuitously by the postal service. At present the stock of cinematograph films is not a very comprehensive one, but the work of making it such is being actively pushed forward by producers with the assistance of several publishers of school books and medical and scientific works.

An association in Paris which goes by the name of "L'Art à l'Ecole," and includes among its members some artists and people interested in juvenile training, has recently held a congress for determining the lines which should be followed in the production of films for use in schools, in which work it has received the support of public authorities and the municipality of Paris. The congress was made the occasion of an exhibition on the premises of the Conservatoire National des Arts et Métiers of types of cinematograph projector and accessories most suitable for use in schools of various degrees from those for the youngest children to the universities. Simple and strong projectors were shown, in particular by MM. Aubert, Gaumont, Mollier and Pathé; also some machines of extremely simple construction, among them some home cinematographs shown by three firms, the Cinoscope Co. and M. Milior and M. Laval.

The same machines were included some short time afterwards in the Paris Fair,

with the addition of some additional models. One of these, the "Lumicycle" of MM. Gaumont, is a cinematograph projector for school use in which the current for the electric lamp is supplied by a small generator which is driven by a wheel operated like an ordinary bicycle. Students take turn in mounting a saddle and working the pair of pedals which generates the light for the projection. MM. Pathé-Cinema showed a miniature Baby projector and a cinematograph camera for amateurs, both using film of less than standard size, *i.e.* of width just under 1 inch.

An interesting new introduction is the "Business Cinevalise" of MM. Mollier, a cinematograph projector completely enclosed in a container of the form of a suit case. By connecting an electric terminal to the holder of any electric lamp, this miniature apparatus allows a commercial traveller to show projections of his goods to customers whom he visits. Film of standard width is used, and a projected picture of about 9 x 7 inch size is shown on a translucent screen which is shielded from external light by dark curtains. The motion pictures can thus be exhibited almost anywhere.

At a stand in the Paris Fair an exhibitor of the "Orthotrope" concave projection screen sought in vain to convince visitors that the image projected on this screen gave a relief effect. At the same exhibition a stand of the Department of Scientific and Industrial Research and Inventions (a branch of the Ministry of Public Instruction) had been converted into a projection theatre for the demonstration of stereoscopic projection by polarized light re-invented by M. P. Toulon. The process in no wise differs from that patented and practised in 1891 by John Anderton, of Birmingham (B. J. Lantern Record, 1892, Oct., p. 6 and 1899, Jan., p. 6). It is a thousand pities that a state department should employ its funds for subsidizing the re-invention of uncommercial processes or, as in the present case, of methods which have been known for years.

In the field of ordinary optical projection an exhibit at the Paris Fair was the Silf outfit, in which the transparencies, to the average number of 25, are supplied on a band of film. There was also shown the automatic Circus projector of M. G. Massiot, designed for luminous advertisements, in which views are arranged radially in a cylindrical basket and are caused to come successively into the lantern stage.

The same constructor shows two further models of optical lantern, one designed particularly for the higher grades of school and serving for either cinematograph or still projection, the latter of ordinary lantern slides, solid objects, and also objects arranged horizontally on a glass plate or in a transparent dish of water, or of microscopic preparations. The other lantern is constructed for the projection of Autochromes and other color transparencies, and at a distance of 18 ft. gives a very bright image at a magnification of about 16 times. The light-source is an incandescent lamp consuming 2.5 amperes at 110 volts. Two of these lanterns can be used together for the production of dissolving views. A rheostat allows of the light in one being gradually lowered whilst that in the other is brought to full power.

I must also mention the production by the firm of Bauchet of a new non-flam cinematograph film in which the picture is formed in the interior of a film of cellaphane and not, as has hitherto been the case, on the outside surface of the support. The film is at present made only in less than the standard size for use in home cinematographs, but it is intended to produce it in the normal size.

HIGH-SPEED PHOTO-ANALYSIS OF MOVEMENT

Chrono-photography of ultra-high frequency for the analysis of extremely rapid movement has been hitherto attempted by means of rotating mirrors, serving to record the successive phases of a moving object. Since 1904 M. Lucien Bull, the successor of Marey, inspired by the results obtained by Marey, Mach, Boys, and Wood respectively in 1879, 1885, 1890, and 1903, has used electric sparks in rapid succession as the source of light The moving object, which may be an insect or a projectile, moves in front of a condenser by which the image of the spark is projected on to the lens. The duration of each period of illumination is so short that whatever the speed of the moving object or of the displacement of the sensitive film, the image is formed with critical sharpness. In these first experiments the frequency of the sparks was regulated by the contacts of a rotating electrical interrupter, similar to the collector of a dynamo, mounted on the same spindle, as the drum (about 3 ft. in circumference) to which the sensitive film was attached. In this way from 50 to 60 photographs could be made with an interval of about 1-1000th of a second between each pair. This first primitive device pro-

vided the means for numerous researches, and M. Bull has now improved it in many important respects as the result of his work during the war in the study of the movements of projectiles from small arms and from guns of very small bore. With the aid of MM. Abraham and Bloch he has been able to record up to 200 images on a rotating film of 3 ft. in length at a rate of 10,000 per second. The sparks obtained by the oscillating discharge between two aluminum hemispheres of a small condenser (itself supplied by a condenser of large capacity) have a frequency which is constant within 1 per cent. and is adjustable at will over a considerable range. The duration of the spark is about one five-millionth of a second and its actinic brilliancy about 160 times that of a 12 ampere arc, or 16 times that of the sun.

The only limit to the frequency with which the images can be recorded is that of separately recording the pictures on the film. It is scarcely possible to give to film mounted on a drum of 1 ft. diameter a peripheral speed of more than 165 ft. per second. Hence with a frequency of 10,000 images per second the height of each image cannot be greater than about one-fifth of an inch (5mm.).

Without altering the electrical device, M. Bull has recently been able to go further as regards separating the images by modifying the photographic part of the apparatus. The film is arranged on the inside of a fixed cylindrical drum of 1 ft. diameter and receives the images formed by a lens, the axis of which coincides with the geometrical axis of the cylinder. The images are diverted to the film by means of a total reflection prism. The small weight of this prism allows of its receiving a speed of rotation of 160 revolutions per second, corresponding with a speed of displacement of the image on the film equal to 1,660 ft. per second. Thus, the images recorded on the film at a frequency of 40,000 per second are half an inch in height, or quarter-inch in height at 80,000 per second. The only drawback to this arrangement is that the images are turned on themselves at the same time that the prism traverses the circumference on which the film is mounted. For the cinematograph projection of a film thus obtained it would therefore be necessary to use an apparatus similar to that employed in taking the pictures, correcting the orientation of the successive images when printing on the positive film.

SOME NEW INTRODUCTIONS

German cameras have again appeared in the French market, where they are frequently offered as second-hand, as a means of disguising their recent importation. Several new firms in the manufacture of cameras, particularly the Gallus Usines, the Noxa Company and the firm of Baille-Lemaire are combating this competition with considerable courage and have afforded evidence of their manufacture of many cameras of excellent design and construction at very moderate prices.

A print-drying machine of the endless web pattern, but of smaller size, has been produced in France for the French Kodak Company from the design of the manager of the firm's finishing department, M. Jellineck the original inventor of machines of this kind. In the present model the lengths of fabric successively envelop two heated cylinders, the temperature of the second being greater than that of the first. The band of fabric moves around the second cylinder in a direction opposite to that in which it moves round the first. One of the first of these machines has been acquired by the Aviation Service and will be officially shown in the international exhibition of aerial photography, which is to be held at Brussels from June 23 to July 9 under the auspices of the Aero Club of Belgium. The machines have been supplied to Kodak, Ltd., London, so that a full description is unnecessary.

At the Paris Fair a Parisian instrument maker, M. R. Piquet, showed a quartz "boiler" for the rapid electrical heating of liquids. It consists of a tube of quartz curved in the shape of an elongated horseshoe and forming an electric resistence. Simply by immersing it in the liquid to be heated, the latter may be brought practically to boiling without danger of injuring the "boiler" or contaminating the liquid. The accessory is one which will be extremely convenient in the preparation of solutions and particularly for bringing working baths to the required temperature.

Half-watt lamps, overrun or run at their proper voltage during the actual exposure, have made considerable strides among portrait studios, and two types of equipment have recently been presented to the studio of the French Photographic Society and tested there with success. These are the Philipps Photocar lamp and a ceiling lamp with vertical diffusion introduced by the firm of Leacap.

PHOTOGRAPHIC PROCESSES

I was interested in obtaining evidence recently of the success which has followed the advocacy by some of the French photographic journals of the more extended use of orthochromatic methods among both professionals and amateurs. In conversation with M. E. Grieshaber, the technical head of the "As de Trèfle" plate-making firm, I learned that the proportion of orthochromatic plates made in his works is now 50 per cent. of the total as compared with 5 per cent. ten years ago. He recorded also a much wider use of anti-halation plates and did not doubt that his experience was also that of other manufacturers.

In a former note I referred to the process of M. F. Monpillard for the extra-sensitizing, as regards both general and color sensitiveness, of emulsions by bathing. The first trials which have been made of this method have shown that it is not the easiest to work. It seems that failures are due to the fact that the silver chloride, or its solution in ammonia, may have been exposed for a short time to light.

M. Louis Lumière has recently published an ingenious method of washing pictures, permitting of this process being carried out in a very short time and with a minimum consumption of water. A fluid ounce of water is sufficient for washing a quarter-plate in 12 to 16 minutes. The process is as follows:—Upon a board, which is placed almost upright, there is fixed a sheet of glass and then a length of absorbent cotton fabric, the upper part of which dips into a small vessel filled with water, whilst the lower part communicates with any receptacle. Under the influence of capillary attraction the strip of fabric forms a kind of siphon, which slowly discharges the contents of the upper vessel into the lower. By laying the negative face down on this fabric, there is a constant passage of the water through the gelatine and a rapid removal of the soluble salts. It is advisable that the negative should be previously treated in an alum bath in order to prevent the texture of the fabric from impressing itself upon the surface of the negative.

Some sensitometric tests have recently been made in the laboratory of the Estienne Municipal School (connected with the book industry) by L. P. Clerc. They show that with wet-collodion plates the reciprocity law may be considered as holding good. Attempts made to determine the value of the Schwarzschild exponent showed that this latter may be considered equal to 1.

COLOR PHOTOGRAPHY

The Salon du Gout Français, after its successful season last year in Paris, has been warmly received on its travels in the United States, in New York, Philadelphia and Chicago, and has now been re-established at the Paris de Glace, Champs Elysées. This collection of nearly 2,000 Autochromes, most of them measuring 16 by 17 in., and of colored transparencies, has aroused the greatest interest among manufacturers and merchants as well as in the minds of the public as regards the advertisement value of photography and particularly of color photography. Most of the Autochroms are perfect examples of the process and many are of extremely difficult subjects. They are shown in panels of a handsome design which adds to their attractiveness. The exhibition, which remains open until the end of August, should most certainly be visited by any of my readers who are passing through Paris.

One of the notable portrait studios in Paris has recently been taken over by the Dufay Patents Company (originators of the Omnicolor plate no longer made) for the exploitation of a process of color photography, the secret of which is being closely guarded. Specimens have been shown only to a very few people and even to them under the greatest secrecy.

Attempts have recently been made in France to negotiate the patents of Dr. A. Traube of Munich for the Uvachrome process, and a demonstration of this process has been given to the French Photographic Society by the Swiss company interested in its exploitation. The three negatives are made in rapid succession on a single plate by means of a repeating back which falls vertically between two successive exposures, its movement controlled by an air brake. The shutter release is connected to that of the repeating back so that their movements alternate without loss of time. It seems to be thought that the fact that the three exposures respectively through the three light filters are equal constitutes an extraordinary invention, although such equality has already been attained in three-color cinematography, whilst it is likewise obtainable without difficulty by increasing the opacity of the more transparent of the light-filters in a three-color set by means of a neutral gray pigment. After development of the negative a print is made on a film of the same quality as positive cinema film. This print is then treated

in a mordanting bath of copper ferricyanide and the three images are then dyed respectively pink, blue-green, and yellow. The dyed films are washed and dried and superimposed in register without being cemented to each other. The influence of the purplish-red color of the mordant appears to have its effect on the greens of the colored picture which were very dark in almost all the specimens shown.

Support is also being sought at the present time for a two-color process of color photography, the novelty of which is scarcely perceptible. A blue carbon print is superimposed on a P.O.P. print which has been toned red. Probably, in order to make still more certain that the two images shall not register, they are made respectively from the two negatives of a stereoscopic pair!

At a recent meeting of the cinematograph section of the French Photographic Society some sections of the two-color film, "The Glorious Adventure" made by the Prizma process of W. van Dorn Kelley were shown and received a most favorable verdict. Part of the film representing a fire was of special merit.—L. P. Clerc, in *The British Journal of Photography.*

Double Toning by Means of Selenium

W. Forstmann, in *Photographische Rundschau,* discusses this subject. In order to obtain, with development paper, tones ranging from black through reddish violet to a warm brown, prints toned with selenium should be reduced. Such range of tones is suitable for several types of prints, such as twilight views, street pictures and snowscapes, inasmuch as they not only give a desirable contrast of light, but they recall to the observer the natural tones. By longer or shorter toning it is possible to secure the desired grading. Reduction does not go so easily to obliteration of the finer impressions in the high-lights, as happens generally with Farmer's solution, as the whole of the silver has been converted into silver selenide, which is not affected by ferricyanides.

The well washed print can be toned in the selenium bath without previous bleaching. Violet tones are obtained most readily from well developed positives. The more the fixed print passes from black to brownish or greenish, the more will the shade be brown-violet after the reduction. Bromide paper, which, as is generally known, is the most difficult to tone with selenium, gives the same tone as gas-light paper, even when, after the selenium bath, no appreciable bluish- or brownish-black is observed. For bromide paper, a bath double the usual concentration is advisable. In cases in which a prolonged development has been necessary, several minutes may be required for proper toning. After brief washing, the print is immersed in a 10% solution of potassium metabisulphite, and, after brief action, washed for ten minutes; the wet print is put in the reducing solution. Prints that have been dried must be well wetted before immersion. Farmer's solution is used, which should have the light yellow tint that marks activity. Thorough washing is required after the fixing. The tone will be brown in proportion to the time in the toning bath. On drying, the prints will change slightly towards violet. If a clearing bath is not used, as indicated above, between the toning and the reducing, the lights will be yellowish, but as the tint extends over the whole print, there may be cases in which it will not be so objectionable.

The Gum-Bichromate Process

T. W. KILMER

The gum process to me is the most beautiful, the easiest of manipulation, the cheapest and the most plastic of any of the photographic processes. I know that it is considered by some to be a very difficult and messy work, and so I thought it to be until a few years ago when I first took it up. Now nearly all of my prints are multiple gums.

The Paper.—Almost any good paper will take gum, but, of course, some papers are better than others. The chief trouble with many papers is that they shrink after being wet: other papers are not strong enough to stand many wettings and disintegrate or tear. The best rule is to get accustomed to using one paper and to stick to it. The paper which I personally use is the Michallet water-color paper: this paper need not be sized at all. In multiple printing the previous coating of gum acts as a sizing.

The Coating Mixture.—This is composed of a solution of gum acacia, a solution of bichromate of potash and some sort of a pigment. The solution of gum is made by dissolving four ounces of the best gum arabic (acacia) tears obtainable, in ten ounces of water. The gum is suspended

in a cheese cloth or muslin bag in the water and takes from two to four days to thoroughly dissolve; this is the gum solution; personally, I never use any kind of a preservative to keep the gum solution fresh: if it turns sour, it is used just the same.

The bichromate solution is made by dissolving as much bichromate of potash crystals in a pint of water as the water will take up; in other words, make a saturated solution of bichromate of potash in water.

The pigment or coloring matter consists of tubes of Winsor and Newton or Devoe moist water-colors. The coating mixture is made by mixing:—

Gum solution...........2 teaspoonfuls
Bichromate solution.....4 teaspoonfuls
Pigment.....1 inch squeezed from tube
Ammonia ....5 drops

The above solution is stirred in a mortar by a pestle until the pigment is thoroughly mixed with the rest of the solution.

To Coat the Paper.—Pin a sheet of paper to a board by using push pins or thumb tacks. Use an ordinary stiff paint brush in brushing on the mixture and stroke it up and down and across many times: when you get the paper coated as smooth as you can with the stiff paint brush, take a wide badger-hair blending brush and lightly stroke the surface of the paper up and down and across until the coating mixture looks smoothly applied. Remove paper from board and hang it up to dry in a dark closet or room. It now has about the speed of albumen or proof paper.

The negative for gum work should be thin and never contrasty. When the coated paper is dry, place it in contact with the negative in a printing-frame and print in the sun for from three to fifteen minutes, depending upon the negative. A meter may be used, but several trial strips of gum paper are the best guides to correct exposure. After printing, place the print face down in a large tray full of cold water, see that no air bells form and examine the print from time to time. The finished product will be dried down somewhat and a little darker than the gum print when wet. Local work may be done on the wet print by use of an ordinary atomizer, or a medicine dropper, or a small rubber tube attached to the water faucet. Do not dry the finished print by heat. After drying, the finished print is best soaked in a solution of alum, one ounce to the pint of water; this removes all traces of the yellow bichromate solution and further hardens the gum. After the alum bath, the print should be washed and hung up to dry. Multiple printing is done by again coating the print with the pigment solution and by using any of the ordinary methods for correct registration of print and negative, printing on as many coats as the maker desires. In multiple printing, do not use the alum bath until after the final printing. —*The Club Photographer.*

Employing the Salts of Uranium for Toning Purposes

A. J. JARMAN

Whenever the toning of prints of any kind is undertaken with the salts of uranium, three points of importance must be attended to for success. First, the ferricyanide of potassium that is to be used must have been kept in an amber-colored bottle to protect it from injurious action of white light. Secondly, amber-colored bottles must be used to keep the prepared solution in. Thirdly, the toning operation must be carried on under a weak or yellow light. The remark has been made by some photographers that they never could get good tones with the salts of uranium. The writer remembers one case where the photographer stated that he never could get the salts of uranium to tone at all. If the directions here given are followed to the letter, no one need despair of securing fine brilliant tones, varying in color from a rich chocolate brown to a fine bartolozzi red, either with a plain black platinum print or silver prints made upon the chloride or bromide papers. Some tests have been carried out quite recently purposely to meet the requirements of this article. When carrying this class of work out it will be found that the older the prints the longer will be the time required for the toning, while the newer the print the shorter will be the time required.

Five black platinum prints were tried that were made in 1901, the prints were somewhat weak, as they always should be when uranium toning is resorted to, because the deposit of ferricyanide of uranium formed is of a vigorous nature upon every part of the image. It will surprise those who never tried this kind of toning before to see how every little detail becomes apparent, both in the flesh and in the light drapery, although quite invisible in the print previous to toning.

The following bath was used with com-

plete success, but it required forty minutes to secure perfect toning with these old platinum prints. It may be remarked here that new or freshly made prints will only require ten minutes at the most to secure a beautiful red brown, while longer toning with an increase of acetic acid will give a periect bartolozzi red.

Uranium Toning Solution

A

Nitrate of uranium..........	30 gr.
Filtered water	10 oz.
Acetic acid, No. 8............	1 oz.

B

Ferricyanide of potassium (red prussiate of potash)..	30 gr.
Filtered water	10 oz.
Acetic acid, No. 8............	1 oz.

When the salts are dissolved, the two solutions should be mixed. Do not attempt to mix them until the acetic acid has been added to each solution. Pour these solutions into a clean tray. Then insert the dry prints. Turn them over occasionally to observe the change in color and the depth of toning. A freshly made platinum print will tone rapidly, but an old one will require considerable time; in fact, a quarter of an hour may elapse before a faint change in color may be observed. Those who expect everything done on the instantaneous plan will be disappointed. Let the toning continue, allow the prints to stand for a short time, then, upon examination, it will be found that a decided change has taken place, while the color is an extremely rich brown. A brilliant red is obtained by increasing the quantity of acetic acid. As soon as the desired color is acquired the prints must be drained, then placed in a washing bath of weak acetic acid.

Water	16 oz.
Acetic acid, No. 8..........	½ oz.

The prints may be allowed to soak in this for ten minutes, then changed to another bath of the same kind, after which they may be well washed in running water for a few minutes, rubbed surface dry between clean blotters and suspended to complete the drying. Bromide and chloride prints may also be toned in a solution of the same proportions. The prints, if newly made, will tone very rapidly, so much so that if a rich brown color is aimed for, the toning must be cut short before the brown is reached, because the toning goes on even when placed into clean, cold water by virtue of the toning chemicals that are held in the body of the paper.

If the acidity of the bath is slightly increased the color of the prints made upon the gaslight papers will become an intense red. In fact, the strength of the toning solution may be reduced considerably for gaslight papers. Double the quantity of water may be used without detriment.

Several prints made upon glossy Azo and washed well, then toned as described, the resulting color was a very brilliant red, with those parts which had been reduced by the developer becoming quite matt, the highlights remained glossy, while a matt bromide print remained matt all over the surface.

Recent Patents

1,418,033. Means for Taking Photographs with Special Scenic or Background Effects. A portable device adapted to be used in connection with a camera for taking photographs with special scenic or background effects, comprising a supporting framework mounted adjacent the front end of the camera and having top and bottom closures, and a transparent screen arranged at an angle of substantially 45° to the axis of the camera and supported by the top and bottom closure.

1,418,690. Photographic Enlarger. A photographic device comprising a lens holder and a screen, a rotatable cam member having a pair of spiral cam elements of unlike contour, followers engaging said elements, and connections between the respective followers and said lens holder and screen respectively.

1,418,280. Photographic Camera. In a camera, the combination with a body member, a cover member and a hinge connecting them arranged parallel with but between the planes of the front and rear faces of the members, of links pivoted to one member above the hinge extending across the hinge when the members are opened, said links having curved slots at their free ends and pins located on the other member below the hinge and occupying the curved slots.

1,419,901. Device to Obtain Stereoscopic Effects in Cinematographic Projections. A device for obtaining stereoscopic effects in cinematographic projections comprising in combination a spherical inclined mirror, a screen arranged between the focus and the center of the mirror, a projecting apparatus, said screen being suitably inclined to reflect on the concave mirror the image projected by said apparatus and to obtain a true and large and not reverse image of the scene projected on the screen, said screen having a convex surface to correct the deformations of the horizontal lines and other distortions of the image projected.

Lantern Slide Toning

The following method for toning lantern slides is given in *Photo-Rundschau:*

The well-washed slide is first placed in a bath consisting of

Copper sulphate	7.5	grams
Ammonium citrate	25	grams
Ferri-cyanide potassium	8	grams
Ammonium carbonate	4	grams
Water	2	litres

Dissolve each salt separately in a quantity of the water necessary; filter and then make up the quantity of solution.

Toning takes about 5 to 10 minutes for completion at 70 degrees F., then wash well for 10 minutes. The toning bath must be kept in the dark, as it suffers decomposition in the light.

For red-tones the above-toned image, after washing, is placed in

Safranin	1	gram
Acetic acid	5	c. c. m.
Water	1	litre

The color is heightened in intensity by duration of the toning (from 5 to 10 minutes). A good washing is necessary after the toning. Should the high-lights discolor, continue the washing process till clear.

For violet tone, use, in place of the Safranin bath, the following:

Methylviolet	0.4	g.
Acetic acid	5	c. c. m.
Water	1	litre

Comparison of Value of Methods of Preventing Halo

Professor Namias, the well-known Italian photographic expert, has described, in an Italian journal, some studies made upon the methods commonly used for avoiding halo. The account here given is a translation from an article in *Photo-Pratique* which gives substance of Namias' report.

Three methods of coating plates to avoid halo are in use. In one the back of the plate is coated with a black layer; another method is to place an absorbing layer between the glass and the sensitive emulsion; a third method is to color the emulsion. Namias tested plates prepared by these methods by placing on the sensitive surface a safety razor blade and exposing to light. The perforations appear upon development as black spots, and if halo is produced, a clear ring will be around these spots, outside of which is a grayish penumbra. It was found that the plates prepared by the first method gave very marked halo, but those in which the absorbing material was placed between the emulsion and the glass were very sastisfactory. Plates prepared by incorporating the color with the emulsion (as employed for instance by Huaff), were superior to those with coated backs, but not as good as those made by the second method. Coloration of the plate with tartrazin, auramin and similar colors, does not materially diminish the effect if color-strength is low, while if strong solutions are employed, the sensibility of the plate is much lowered. When films are used, the halo is always slight, that which appears being due to irradiation and not to reflection, as is the case with plates. It appears in general only when there is strong contrast in the object photographed and with highly sensitive plates. Such a halo will, however, be objectionable in many operations in scientific photography, but here plates of comparatively low sensitiveness are commonly employed. For sky photography, Namias recommends films with orthochromatic emulsions. Manufacturers should give special attention to the preparation of non-halo plates. In conclusion, Namias states that the new developer "Neol" is of use in diminishing halo, but does not entirely prevent it.

Winning Picture in the John G. Marshall Meteor Flash Powder Competition for May. Made by Roland W. Reed, Detroit, Mich

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BIRDS, OLD AND YOUNG, AS PHOTOGRAPHIC SUBJECTS—L. W. BROWNELL

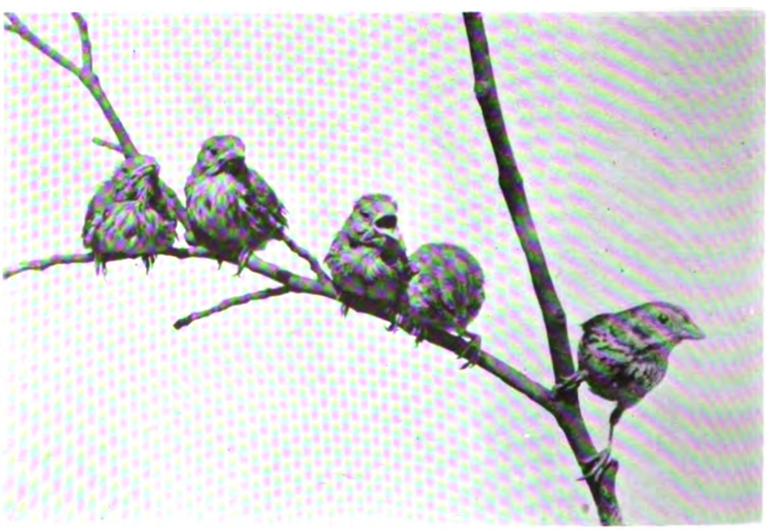
AT the beginning I wish to state that obtaining pictures of birds, both adults and young, away from the nests is, in all probability, pre-eminently the most difficult of all the many branches of Nature photography and unless one is blessed with at least several times the normal amount of patience that is possessed by the average person, and even then, is fully prepared to have that patience tried to its uttermost extent, he had much better never attempt it. In photographing birds at the nest, we have at least the satisfaction of knowing that the young must remain where they are and that it is, in the great majority of cases, merely a matter of time when the parent birds will visit them. In photographing birds away from the nest, however, we have no such assurance. In fact, we can be pretty certain that, in at least ninety-nine cases out of one hundred, they will do about everything that they can except just that thing that we wish them to do.

The one best method of obtaining bird portraits, either at the nest or away from it, is by enticing them to the spot upon which we wish them to perch by using their young as decoys. This not only insures good pictures of the adults, but of the young as well, and of the manner in which they are fed. This method sounds rather simple, but, in reality, it is not so simple as it appears. In the first place, the young must not be too young or else they will be unable to cling to the branch nor must they be too old, for then they will be able to fly for a short distance and at this stage the possibility of inducing them to remain for more than a fraction of a second on any perch where they are placed is very remote. The psychological time for making the attempt is two or three days before they would naturally leave the nest of their own accord.

They are well able, at this time, to cling to any perch nor will the taking of them from their nest work them any harm, even though they should not be returned to it. In fact, having once found themselves free from the nest, they are nearly always loth to return to it and will struggle out as fast as they are put in.

In order to surely secure these young birds at the proper age, one must have some knowledge of their habits for, having once found the nest with young or eggs, as the case may be, he must be able to judge of the length of time that must elapse before they are in the proper condition for handling. The period of time occupied by the young in the nest varies with different species. The quails, sandpipers, plovers, etc., leave almost as soon as they are hatched and every egg in a grouse's nest may hatch and the young leave in the course of two or three hours. Swallows always remain in their nests until they are able to fly and none of the birds that breed in the trees leave their nests until they are very close to this stage and can perch with safety in the branches. The ground breeders, to the contrary, and even those that breed in low bushes, frequently desert their nests as soon as they can struggle out and when they are once gone, it is difficult to find them among the long grass and low herbage.

In the posing of the young and inducing them to remain where they are placed, is the one part of bird photography that is apt to try one's patience to the fullest extent. It seems as though each one of the little creatures was the embodiment of obstinacy. They will fight against being placed upon any perch, pushing away from it with all their strength, and their feet, apparently, are things the use of which they have no idea, for they persistently refuse to clasp them about the branch or twig. Finally, however, they learn that these feet are things upon which to stand and condescend to make the effort, but it is merely



"SONG-SPARROW FAMILY" L. W. BROWNELL

JOANNA ROOS NICKOLAS MURAY

From the Members' Exhibit of The Camera Club, New York

"A VENETIAN WELL" CHARLES I. BERG

From the Members' Exhibit of The Camera Club, New York

a piece of trickery on their part to make you think that they are reconciled to their fate, for the minute you let go your hold upon them, they will hop from the branch and fall to the ground and you have it all to do over again. After repeating this operation thirty or forty times you may finally succeed in enticing your subject to "stay put," but you may be absolutely certain that long before you have succeeded in doing so with the second youngster, the first will have gone back on his bargain and so the merry game goes on, until you are about ready to give up the attempt and forswear bird photography for all time. Nor after you have at last succeeded in making the young stay where you want them are your troubles over for, even if the adult does not cause them to leave the perch upon which you have, with such difficulty placed them, by calling to them from one near by, it is about a ten to one shot that the excitement caused by the first approach of the parent bird will cause at least one or two of them to fall from the perch. For this reason I have found that it pays to work with only one young except when they are fairly tractable.

In doing the focusing, after having them satisfactorily arranged upon the branch, always be sure that there is sufficient space upon both sides of the young to admit of the adult, so that its image may be fully upon the plate when the exposure is made. It will not do to leave this space at one side only, for as surely as this is done, the bird will conclude to alight upon the opposite side, even though it should happen to be the most inconvenient side to choose. As I have

"BARRED OWL" L. W. BROWNELL

before remarked, a bird is an obstinate creature and seems invariably to try to do only such things as he should not do, at least from our viewpoint.

Always, in handling young birds, use the greatest care, for they are easily injured by being held too tightly. Also, if the adult bird is very obdurate and refuses to come to its offspring within a couple of hours, it is well to remove the camera, and incidentally yourself for a short time and allow it to feed them. This prevents them from becoming too hungry and consequently restless. Moreover, I have found that the adult bird will often return more quickly after the camera has been replaced. As in all wild animal photography, the more successfully one hides himself the more chances for success in the accomplishment of his aims will he have. Also, if the camera itself can, in any way, be camouflaged, it will be found to help matters very greatly. I have known birds to come to their young in the presence of persons, when they would not if the camera was set up within a few feet of them and, on the other hand, I have known them to ignore the camera but be fearful of a person fifty or more feet away. Also, but unfortunately rarely, I have known them to show no fear of either, no matter how close they were. All birds have their idiosyncrasies and, if we would obtain their pictures, we must do our best to humor them.

To obtain the photograph of an adult bird without the young presents, naturally, much greater difficulties. An occasional lucky shot may be had at one with a reflex camera, but the only really successful plan is to photograph them in captivity. This I hesitate to advocate, although some very excellent results have been obtained by this method. One ornithologist of note had a whole room fitted up as a bird studio. In this he liberated his subjects and allowed them to become partially tamed before operating upon them. In this manner he obtained

"FEMALE SHOVELLER" L. W. BROWNELL

JOHN HOWARD PAINE

E. HODGSON SMART JOHN HOWARD PAINE

some very fine results, but they were merely photographs of the birds themselves, showing nothing of their environment and plainly showed on the face of them exactly what they were, pictures of captive birds.

With one of the modern rapid tele-photo lenses, one may frequently obtain good photos of perching birds and, when the detail is clear, these, no matter how small the image, may always be enlarged with much success. Also a bird, in going to and from her nest, frequently makes use of the same stopping place on nearly every trip. If we can discover one of these resting places we can frequently obtain pictures of the bird by setting up the camera and focusing on this spot.

Mr. Frank M. Chapman describes the obtaining of photographs of a bird by setting up a stuffed owl in proximity to its nest. The bird, upon discovering the owl, immediately flew to take up battle with it in defense of its nest and young and while thus engaged, almost obvious to everything else, he obtained his pictures. As I have never tried this method, I cannot speak authoritatively concerning it. I should think it might be worked successfully with some birds, but not all and, moreover, it would seem an expensive method, for the bird, according to the story, completely ruined the owl before leaving him.

In the winter it is, of course, very easy, if one lives in the country, to entice many different species of our winter birds to the camera by means of food regularly placed every day at the same spot. This should be done in some spot near which a camera may be hidden. A good way is to have a small tent inside of which to set up the camera and outside of which to erect the feeding stand. This may be arranged according to one's ingenuity with stumps, branches, etc., upon which to place the food, which should consist of grain of almost any kind for the seed eaters, bits of suet, raw pork, meat, etc., for the woodpeckers, titmice, etc. After several days of baiting, with fresh supply every day, one will find that the birds are coming regularly to this stand looking for their food and, as the winter progresses, more and more will be found to visit it. This is a really excellent method of obtaining portraits of our birds, the only drawback being that the number of species, whose portraits may be thus obtained, is limited.

Birds have even been known to take their own pictures by so arranging a piece of string tied to some food that, when the food is pulled at, the shutter will be released. This method, however, has never appealed to me owing to its uncertainty. The mechanism for the releasing of the shutter is, necessarily, more or less complicated and does not always work and when it does, the bird is more or less apt to be out of focus. Moreover, the string is almost sure to show in the picture and so spoil the effect. However, it is possible that some such device, that would work surely and properly, might be worked out by some one with sufficient ingenuity.

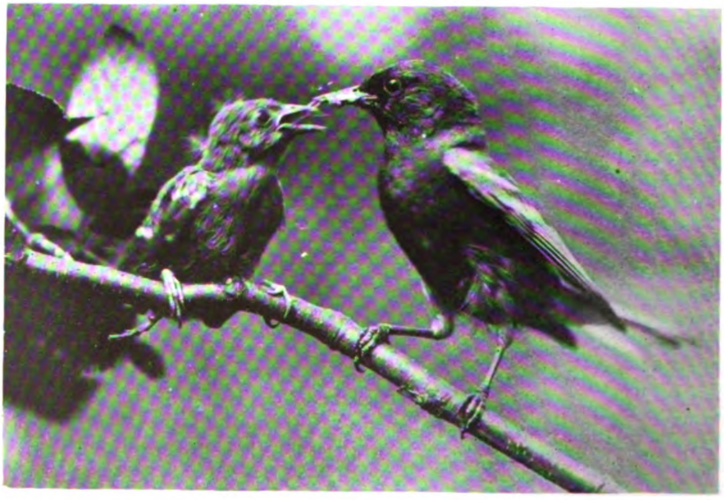
In work upon the water birds, the blinds, decoys, sneak-boxes and batteries of the sportsman can, naturally, be used to advantage. It is almost imperative that one uses a camera of the reflex type in this connection, for the

space wherein your subject may alight cannot be greatly restricted. A reflex camera is something that the serious bird photographer cannot well do without, for with it, many chances at good pictures may be had that, without it, would be impossible. Photographing flying or soaring birds is an utter impossibility without a camera of this type, but with one, excellent pictures of this kind may be obtained. Mr. Herbert K. Job has made some photographs, with a reflex camera, of sea birds taken from the deck of a fishing vessel, that have never been equaled, to my way of thinking, but with the ordinary tripod outfit he would have gotten nothing.

As reds and yellows are very prominent colors in the plumage of many of our birds, it is always well to use nothing but the fast orthochromatic plate. Of course it is impossible to use the color screen with it, but without the screen, this plate will produce very much closer to the correct color value than will the ordinary plate.

In using the tripod outfit and releasing the shutter from a distance string may, of course, be substituted for the rubber tubing of which I spoke in my original paper on bird photography. This has the advantage of being much cheaper but it also has its disadvantage. I have frequently known birds to alight upon the tubing and once, when photographing a catbird at her nest, the old bird actually fought with the tubing, catching it in her bill and claws and giving it vicious tugs. Had I been using twine, the shutter would, undoubtedly, have been released and a number of plates would have been wasted. However, this does not often happen and, as I have said, string is cheaper than rubber tubing and also lighter and less cumbersome to carry.

I cannot close without a word for the birds. In all work with them always bear their rights in mind and do not annoy them unnecessarily. Above all things, do nothing that will endanger their lives.

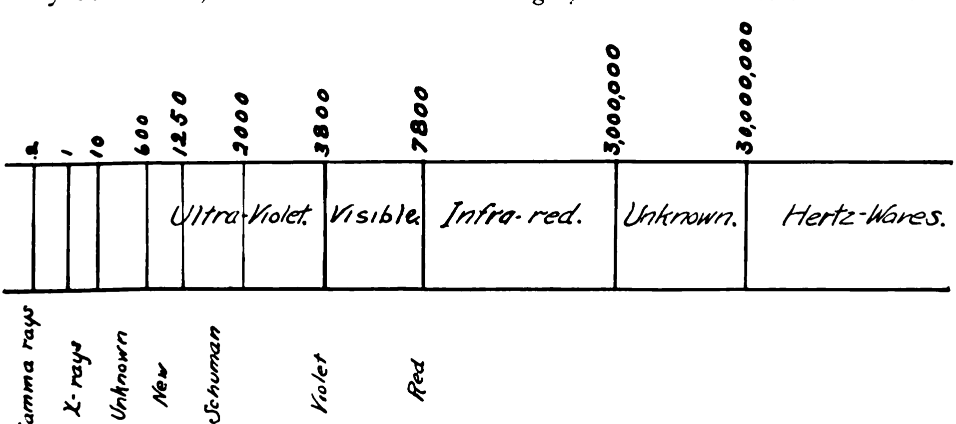


"BLUE-WINGED WARBLER AND YOUNG" L. W. BROWNELL

THE LIGHT OF THE GLOW-WORM

ONE of the pressing problems of the present time is the elimination of the large proportion of heat rays that accompany all our sources of light, natural and artificial. The production of a "cold light" would be of immense advantage in many ways. The application of spectrum analysis has been a great aid to the determination of the distribution of heat, illuminating power and chemical action among the several rates of vibration which make up white light. It is known that standard photographic emulsions are much more powerfully affected by the colors from violet to blue than from those that cover the area from green to red. By special methods of sensitizing, the range of susceptibility can be much extended and the panchromatic plate is now a familiar form. Light has been, for many years, considered by physicists as due to very rapid vibrations, white being a mixture of many rates. This theory seems to be losing ground, although, as yet, no definite substitute has been offered, but the nomenclature based on the older view still holds place in the literature. The wave lengths of all vibrations that are included in the field of light are very minute, and are measured in terms of the "Angström unit," commonly abbreviated to A. U., which is one ten-millionth of a millimeter. The human eye can perceive, as light, vibrations ranging approximately from 4000 to 7500 A. U., the low figure being that of the visible violet, the high one that of the visible red. The wave length is inverse to the rapidity, that is, the slowest waves have the greatest length. As is well known to all who have to do with the action of light, vibrations of less than about 4000 A. U. are invisible to the human eye, but, notwithstanding, are injurious to it. Vibrations greater than 7500 are also invisible, but do not seem to be so injurious. The two extremes are respectively termed the "ultra-violet" and the "infra-red."

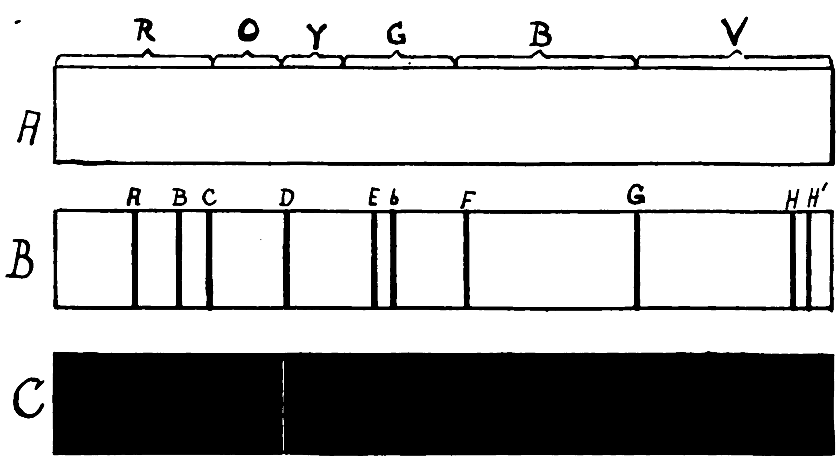
The familiar artificial sources of light are mostly due to the union of oxygen with carbon and hydrogen, that is, to burning. The application of this may be indirect, as in the common electric light, which is the result of the burn-



Diagram, not drawn to scale, including all the known waves, the wave lengths being given in Angstrom units. *Courtesy of the Wagner Free Institute of Science.*

ing of coal under the boilers of the power plant, but an exception exists in the case of water power, the "white coal" of the European engineers. In all these sources, however, the percentage of light obtained is very low compared to the heat, even under the best conditions. Minor sources of light not yet available for commercial purposes are the phenomena of phosphorescence and fluorescence. Some points concerning these were presented in the August issue of THE PHOTOGRAPHIC JOURNAL OF AMERICA. Of the ordinary forms of phosphorescence, excluding that of phosphorus itself, the so-called "fox fire," seen on rotting wood, is rather common. It has long been known that some of the lower animals emit light, the glow-worm and lightning-bug being very familiar, and occurring in many parts of the world. Dahlgren has made extensive studies of this subject, and has found many luminous species living in water. The glow-worm and lightning-bug are entirely terrestrial. Just what part the luminosity plays in the relation of the animals to the environment is presumably not fully known. It would at first thought seem that it cannot serve as a protection, for it makes the animal much more conspicuous, but, on the other hand, almost all predatory animals are aware of the danger of fire, and it may be that the light deceives the enemy. We, however, know so little as to the range of vision of the lower animals that we cannot be sure as to what a given animal, an owl, for instance, actually sees as it is searching for prey at night.

It has long been known that the light of animals and phosphorescent substances is somewhat richer in what may be called the "colder" rays, that is, those not accompanied by a large proportion of heat, than the common sources. A careful and searching study of the light of the glow-worm and fire-fly has recently been made by Dr. Herbert E. Ives, the results of which have been published in the *Journal of the Franklin Institute.* The questions to be answered in such an investigation are: How much light is produced; what is the efficiency of the animal, that is, what is the cost in tissue change; what is the



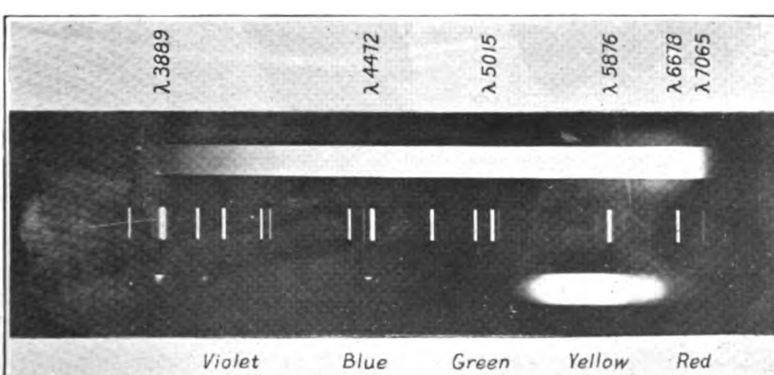
A.—Solar spectrum, showing the approximate color-areas visible to the human eye.
B.—Characteristic dark lines in the visible solar spectrum.
C.—Yellow line of sodium.

Courtesy of the Wagner Free Institute of Science.

quality of the light, that is, what is the proportion between the heat and light rays? In determining these points, spectrum analysis is of much value, and also the employment of standard units of illumination. For many years illumination has been expressed in terms of a standard candle or some equivalent, but more exact units have been lately employed. It is not necessary to explain here the somewhat intricate mathematical principles involved in this modern system. It will suffice to summarize Dr. Ives' results. Some difficulties arise in such investigations, but these have been overcome. We must not be misled by the small amount of light emitted by the common fire-fly. A larger species, found in Jamaica, has been estimated by Pickering to give a light of 0.004 candle. In these fire-flies the luminous area is about 1.5 centimeters (¼ sq. in.). Apart from any other consideration, the fact that the light is only available in flashes would render it of little practical value, but in the larval condition the animal shines with a steady glow nearly, if not quite, of the same power as the flashes of the mature insect.

The most interesting point about the light is its comparison with that of a common incandescent lamp, as regards the respective spectra. The illustration shows that the glow-worm light covers only that part of the spectrum which has small action on the common photographic emulsion, but to which the human eye is most sensitive. It is seen to be a continuous spectrum, as might be expected, inasmuch as it is a solid body. The striking difference between the spectra of solid substances and gases is also shown by the spectrum of helium, which has been inserted. For further elucidation of the subject a diagram of the range of the spectrum visible and invisible has been inserted.

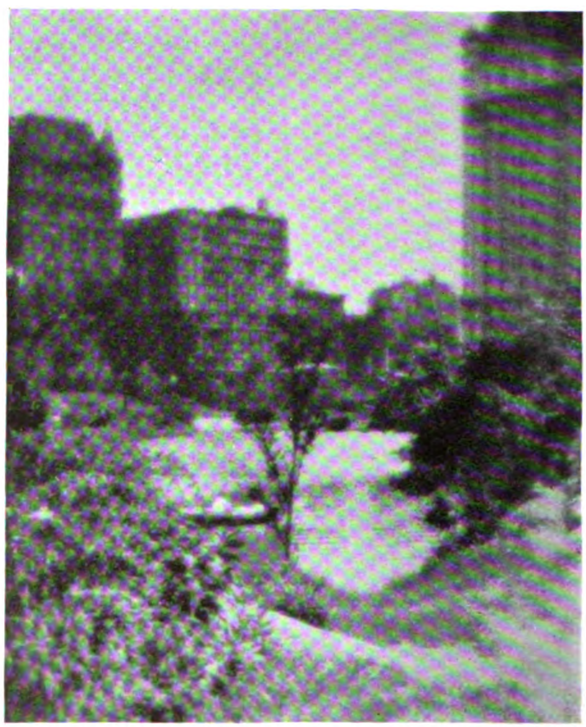
Dr. Ives' conclusion is that these insects produce a light of a quality that would be advantageous for many kinds of work. The efficiency, that is, the amount produced in proportion to the animal tissues consumed, is high. It is, however, limited to a small range of the spectrum. Could the production be extended to cover the whole of the visible spectrum, the result would be a source many times greater than any artificial illumination now in use.



Comparative spectra of incandescent electric bulb (upper line), helium (middle line), and glow-worm light (lowest line). *Courtesy of The Franklin Institute.*

THE OXALATE DEVELOPER AS A DESENSITIZER

THE mixture of potassium oxalate and ferrous sulphate (green sulphate) as a developer was introduced in 1877 by Matthew Carey Lea, prominent Philadelphia research chemist, who was especially interested in photography and photographic chemistry. The mixture was largely used in the early days of commercial dry plates, but has of recent years been but little noticed by the general run of photographers, professional and amateur. It is, however, well worthy of attention. Its action depends largely upon the tendency of the iron compound to reduce the silver halide to the metallic state. An acid solution of iron sulphate was almost entirely used in the development of the wet plate, but this seems to have no appreciable effect on the standard dry plate. Ferrous oxalate, which will be formed in part, at least, when ferrous sulphate and potassium oxalate are mixed, is insoluble in water, but the proportions prescribed in making the developer give a large excess of potassium oxalate, which forms a soluble double salt, potassium ferrous oxalate, which is freely soluble. Unfortunately, sodium oxalate does



LINES, ANGLES AND CURVES FLOYD VAIL, F.R.P.S.

From the Members' Exhibit of The Camera Club, New York

not give the same result. Ammonium oxalate can be used but has no advantage either as to price or efficiency. The solution is usually quite red, due to conversion of some of the ferrous salt into the ferric form. Schiendl, in his history of photography, states that R. Hunt, some thirty years previous to Lea's announcement, had discovered that ferric ammonium oxalate was reduced in the light to the ferrous form and that by applying a silver nitrate solution to this the affected area could be developed, but it did not occur to him to try a reversal of the procedure.

These introductory remarks are drawn from the limbo of forgotten things, because in a recent number of *Photographische Rundschau,* Helmar Bäckström, of Stockholm, details experiments showing that the oxalate developer has a distinct desensitizing effect, permitting the development of highly sensitive plates in a moderate light. Here, again, it appears that the fact was published long ago, as a communication appeared in *Wilson's Photographic Magazine* (of which the PHOTOGRAPHIC JOURNAL OF AMERICA is the successor) in July, 1889. The article is in the form of a talk with Dr. J. J. Higgins. It is there stated that a Seed's plate, after exposure under a glass positive, was introduced into the oxalate developer in the dark and kept thus protected for two minutes, when the gas light was turned up and the development continued, the operator

"SWIMMING HOLE" FLOYD VAIL, F. R. P. S.

From the Members' Exhibit of The Camera Club, New York

standing between the light and the plate, thus protecting it from direct light. After the action has continued for a few minutes, even this precaution is unnecessary and the light can be allowed to fall directly on the plate. No fog results if the light is some feet away, but approached within a foot of the plate a veiling begins. Higgins stated that he had used the method since 1885, and had developed thousands of plates by it.

Influenced by these details Bäckström made a number of experiments, using the following formulas for the solutions:

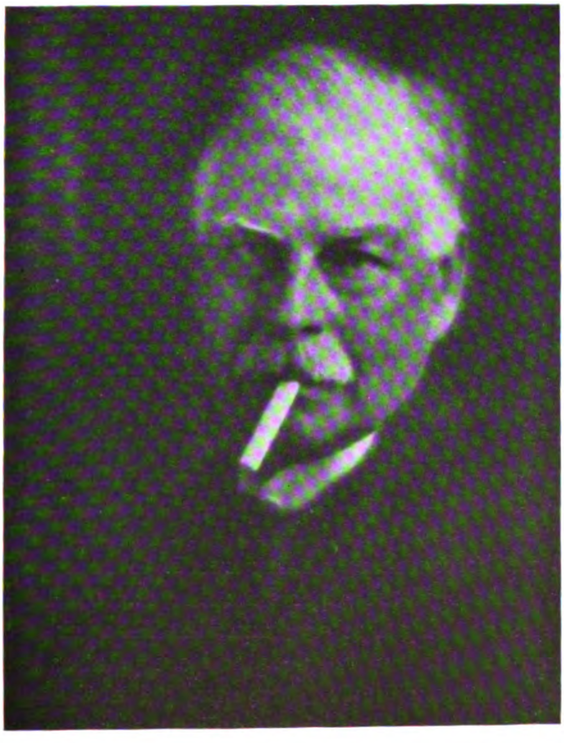
A	Potassium oxalate	100 c. c.
	Water	400 c. c.
B	Ferrous sulphate (green vitriol)	100 c. c.
	Water	300 c. c.
	Strong sulphuric acid	5 drops

These solutions should be kept separate until about to be used, when they are mixed in the proportion of 4 volumes of A to 1 volume of B. Addition of bromide is not necessary, except when considerable over-exposure has occurred. Initial experiments were made as follows: Two unexposed plates were selected; one was immersed in the developer, the other in plain water. After two minutes, a strong light was turned on and the plate that had been in water was transferred to the developer. The plate that had been previously immersed in the developer showed a trifle veiling, while the other plate became promptly black. The preliminary treatment with the developer had, therefore, a desensitizing action. It may be supposed that the red tint of the developer is the cause of the protective effect. Red solutions have long been used for such purposes. Safranin, however, and the latter suggested desensitizers act specifically, and Bäckström proceeded to determine if the oxalate had also such action. The first experiments were repeated, but five minutes' immersion of each plate was given, the plate in the water was covered on the coated side with a glass plate, so that the developer was kept away from the emulsion, and immersed in the developer with the other plate, care being taken that both were well covered. After a short exposure to light, the development was allowed to proceed. As before, the plate immersed in water was heavily fogged, while that which had been in the developer showed only slight veiling. Tests by means of the Eder-Hecht sensitometer showed a great diminution in sensitiveness by the action of the oxalate solution. Even when the oxalate was washed off of the one plate, and it and the water-soaked one developed in light, a notable diminution of sensitiveness was evident. The first experiment was made with a slow plate, but the second and third with extra-rapid plates. The experiments show that the oxalate has a distinct desensitizing action, and is not merely a filter. Further trial with extra-rapid plates showed that one minute of immersion in darkness in oxalate will permit the subsequent development in a good artificial light without danger of serious fog. Daylight is not safe. The procedure seems to be about as good as that with phenosafranin and the oxalate does not stain the plate.

Bäckström sums up his investigations as follows:

The oxalate developer is a good desensitizer; short immersion in it in darkness permits the later development to go on in a convenient light. It seems especially adapted for autochromes. The use of this method was carried out in the United States in 1889. In a later issue of the German journal, Lüppo-Cramer takes up the question stating that he had already heard of the action of the oxalate solution, and has recently confirmed it by experiment. He states that he found solutions that had been already used more active than fresh ones. It might be possible, therefore, to use the exhausted material for the preliminary treatment and complete the development in an active mixture. The oxalate developer cannot be mixed with the other common developers, and the solution, as indicated in the formula, is slightly acid. Phenosafranin can be added to any of the organic developers, which are alkaline. As far as regards the staining power of phenosafranin, Lüppo-Cramer suggests that pinakryptol green may be used, which does not have a high staining power.

In discussing these subjects, it must not be forgotten that most developers reduce, after a few minutes action, very much the sensitiveness of the ordinary emulsions. In the processes of making positives by one operation, in which the negative image is destroyed by oxidation, it is usually found that the second exposure has to be to a very strong light, such as a burning magnesium ribbon, in order to get a good development.



E. L. McGINNIS, M. D. T. W. KILMER, M. D.

From the Members' Exhibit of The Camera Club, New York

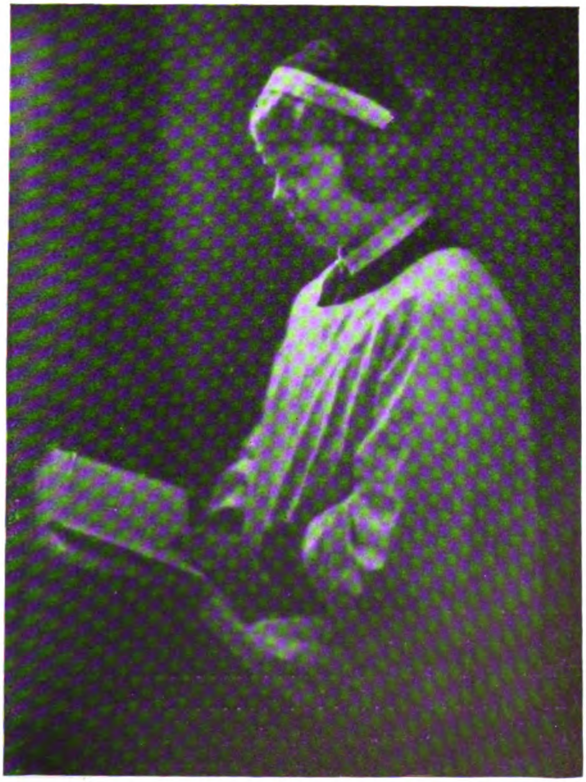
COLOR SENSITIZING BY BATHING

PLATES and films may be sensitized either by incorporating the sensitizing material with the emulsion or by immersing in a solution of the color. The latter method usually gives a greater sensitiveness, but the keeping quality of the emulsion is not as high as a rule. The methods and results of several procedures have been lately investigated in the Bureau of Standards, by Francis M. Walters, Jr., and Raymond Davis, and published in a bulletin of the Bureau.

The amount of dye required is quite small. This is a characteristic of the modern synthetic dyes, which have high coloring power. One-fifteenth of a grain to about three fluid ounces of emulsion gives the best results with most dyes, and in the bathing method, a solution containing one part in 25,000 or even in 75,000 will suffice. Much more dilute solutions have some action. The essential requirement in these procedures is that the dye has the power to associate itself strongly with the silver halide. Dyes have, as is well known, much power of this type, which is known to chemists as "adsorption." Such are technically termed "substantive," being distinguished from those that require the addition of a third substance to secure attachment to the material to be dyed. Dyes of the latter class are termed "adjective." It is, therefore, only the substantive dyes that can be used for photographic purposes. Those that sensitize for yellow-green are of red tint; that sensitize for orange are purple, and that sensitize for red are greenish. Many of the coal-tar colors are "dichroic," that is, show one color when observed by reflected light and the complementary color by transmitted light. A number of them are also fluorescent, that is, produce a specific change in the light that is reflected from them. Silver bromide is much the best salt yet known for sensitizing. The dyes must be either soluble in water, or capable of forming a fairly stable suspension. Dyes soluble only in oils or alcohol will not permeate the gelatin, and hence cannot reach the silver salt. The material must not stain the gelatin. These conditions, of course, limit the number of available sensitizers. Before the war, Germany was the only important supply, but satisfactory dyes are now made in several countries. The color laboratory of the United States Department of Agriculture has prepared pinaverdol, pinacyanol and dicyanin. There is promise of the preparation of new sensitizers which will be of much use with panchromatic plates. For most purposes, the standard panchromatic plates are satisfactory, but occasions have arisen for which a special form is needed, such as photographing infra-red rays and faint light emissions. Investigators, who have these problems before them, usually resort to bathing their plates just before use. The authors of the paper state that they have found it advisable to use methods of sensitizing that are somewhat different from those recommended by the manufacturers of the dyes, and one point to be determined was the relative values of these methods. The principal work was done with commercial orthochromatic plates and pinacyanol, but other dyes were studied.

To determine the values of the methods, two series of tests were used:

(1) The continuous spectrum of white light was taken on the plate; (2) The speed factor of the plate to white light was measured and the filter-factors also with a given set of color-filters. For the spectrographic method, a special apparatus was used, which is described at some length in the report. It serves to determine qualitatively the conditions, but for quantitative work, such as the study of the influence of the time of bathing or the effect of different proportions of dye, photographic sensitometry must be used. This consists in the exposure of a plate to a known source of light for definite times, development under uniform and standard conditions, and valuing the degree of deposit. The details of this method will be given in a subsequent publication. It is carried out by using filters that transmit light of particular colors. The selection of screens was: Wratten A, giving red sensitiveness; B, which gives green; C, which gives blue, and G, which gives nearly the sensitiveness due to the dye. The sensitiveness of the plate to the light transmitted by the filter may be measured, either by introducing the filter between the light source and the plate, or by determining the speed to white light and dividing this by the filter-factor of the plate.



"THE CHOIR GIRL" T. W. KILMER, M. D.

From the Members' Exhibit of The Camera Club, New York

Special studies with sensitizing dyes are described at some length. Pinacyanol is one of the most important. Makers' directions were found to give somewhat unsatisfactory results, which were presumed to be due to the presence of some salts in the gelatin. The plates were, therefore, washed well in ordinary water, and dried before sensitizing. The gelatin remains slightly swollen after this, but this causes a taking up of the dye, and shortens the sensitizing time. Washing after sensitizing leaves considerable dye still in the gelatin, outside of that which has combined with the silver salt. Much of this may be removed by treatment with alcohol. Bathed plates should be dried rapidly to avoid fog. Ammonia increases the sensitiveness, but it causes flocculation with pinacyanol, which may be prevented by the addition of alcohol. The Bureau uses the following formula:

Water	60	parts
Alcohol (95%)	40	"
Pinacyanol stock solution (1 to 1000)	4	"
Ammonia (28%)	2	"

Ammonia extends the range of sensitiveness towards the red and also increases materially the general sensitiveness, but diminishes the keeping quality. To test the relative keeping qualities of the two methods of bathing, plates were prepared by each, and when dry, packed face to face in an ordinary plate carton. As soon as two sets of plates were thus prepared, one sample of each was exposed in the sensitometer and the filter-factors measured. Another pair was tested a few hours later. Some tests were at daily intervals and then at weekly intervals.

In sensitizing with pinacyanol it was found that the method of pre-washing and bathing in a water-solution of the dye was unsatisfactory, and that the bath of alcohol, water and ammonia was needed. It has been remarked by some that ordinary plates give less fog when bathed than do orthochromatic plates. In bathing films, care must be taken that nothing comes in contact with either side, as the back is often coated with gelatin to prevent curling. The blue sensitiveness of a plate is somewhat decreased by sensitizing.

Dicyanin was used with pre-washing, but failed to give good results. It was found necessary to use alcohol and ammonia, which gave good results, although the dicyanin used was three years old. By means of ammonia photography of the infra-red has been carried as far as 10,000 A. U., while without ammonia the range does not go beyond 8,000 A. U. The following bath is used:

Water	60	parts
Alcohol (95%)	40	"
Dicyanin solution (1 to 1,000)	4	"
Ammonia (28%)	4	"

This color requires more care than the others commonly used. In the solid condition it should be bronze-green. If it is brownish, it is unfit for use. A freshly mixed bath is of a bright green color. As the bath deteriorates, the solution becomes dull, and develops a transmission band in the red. The tem-

perature of the bath should not exceed 18°, if fog is to be avoided. An alcohol rinse after the bathing is beneficial.

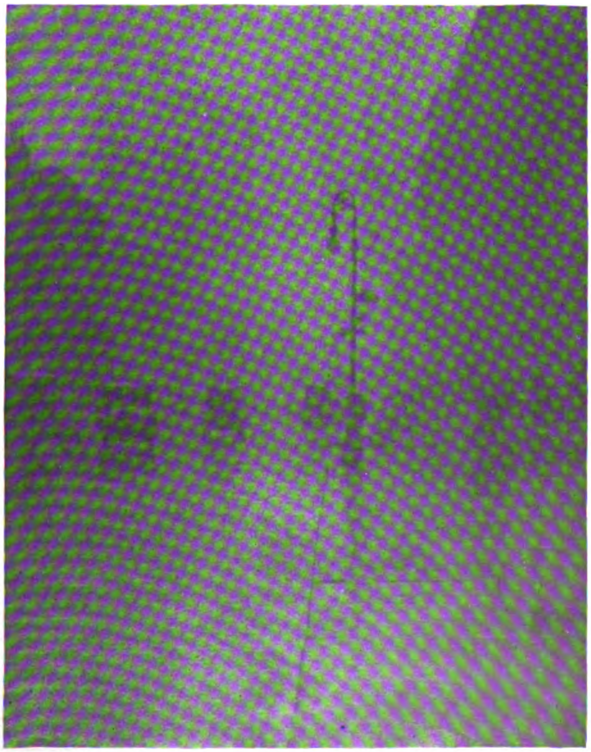
Orthochromatic sensitizers were also tried. The summary of results is as follows:

Dicyanin gives much greater sensitiveness and a range further into the red when used in dilute alcoholic solution with ammonia.

Pinacyanol gives good results in dilute alcoholic solution, but plates bathed in water and stock solution are almost as sensitive and keep much better, provided they have been thoroughly washed before sensitizing to remove soluble salts.

Washing has a favorable action on the color sensitiveness of plates, and, while not as marked as the action of ammonia, it does not tend to produce fog as does ammonia.

The modern orthochromatic sensitizers, pinachrome, pinaverdol, homocol and orthochrome T, are much less sensitive to salts than are pinacyanol and dicyanin. With the orthochromatic sensitizers, except homocol, ammonia does appreciably increase their action. Films are best sensitized in a bath of water, alcohol ammonia and stock solution.



"RAIN AND FOG" BURTON V. WOLCOTT

From the Members' Exhibit of The Camera Club, New York

PHOTOGRAPHS WHICH HAVE PRODUCED COLOR DIRECTLY

FROM the very start of photography, scientific investigators were sanguine of soon solving the problem of photography in natural color. Had they any practical results confirmatory of a successful issue along the line in which they experimented?

From the report of these results, we think we may say that they had. They pursued naturally the direct method, as we now call it, which has been shelved as impracticable, simply because by the other indirect method, such satisfactory results are attained, that it looks like useless effort to try to equal them by costly and uncertain methods of direct impression.

A great deal of money and patient experiment has been expended to bring the new process up to its present excellent presentation, but the scientist feels that we have not solved the problem, that it is not really a process of natural color photography, and in a sort of despair he has come to the conclusion it is waste of energy to pursue experiment along the direct line of investigation. But is he justified in abandoning it?

We cannot say. But we hope that some fortunate unexpected phenomenon may give impulse to a reconsideration. The trouble is, scientific men like all others, have the herd instinct. They follow in the line of least resistance and do not keep eternally at it, till light dawns upon them; and furthermore, there is the egregious disposition to pursue a problem along the academic lines, to take to the grooves of thought, chiseled out for them by the professors. It gives direction, of course, but is apt to hamper freedom in striking out on new and unadvised lines, even if they run into a *cul de sac*, or blind alley. Even if they stumble over some rock in the way, and see sparks, it may show some light, leading somewhere.

It is not as bad as blind following of perversity in the belief that progress further is out of the question. I can remember years back having visited a museum of wonders, where an ingenious German doctor exhibited a very complex piece of mechanism which, by manipulation upon a key board, imitated human utterance, and even staccatically and monotonously repeated a line of some German ditty. I thought it a most marvelous thing and had sanguine expectation of the results which would accrue from perfection along this elaborate mechanical line. It was the product of a German professor. But a few years elapsed and we had the phonograph of Edison—a mechanic who had no use for your academic restrictions. He worked out a stray suggestion along an unexpected line—and the result. So the moral need not be added to the fable. There may be some over-looked presentation which has escaped the earlier investigators in direct color photography, which may give us pause and make some one sit up and think. In other words, may it not be worth while to overhaul, and try over some of the old methods now on the scrap heap, to see if there is something which may have, possibly, escaped the ken of our predecessors

in this line, which will give us a "hunch"? The production of photographs in color dates back to the very early days of photography. In 1801 Ritter showed that chloride of silver tended to give various colored tints when exposed under certain conditions to the light.

But Dr. Seebeck, of Jena, is the first to make a direct color photograph. This was in 1810. He sent to Goethe, the great German poet, an account of his experiments on the action of light on silver chloride, which was published in Goethe's "Farbenlehre."

Seebeck says, "When I directed the Spectrum by a faultless prism, so placed that the incident angle of the front became equal to the refracting angle at the back, on white chloride of silver spread upon paper while wet, through an opening of about five lines in the shutter, and to the distance where the yellow just meets the green, and kept it there for twenty minutes, a change in the chloride of silver was as follows:

"It became red brown in the violet, which color occasionally merged into violet, at other times more to the blue. In the blue part of the spectrum, a true blue was had, which got lighter as it merged to the green. In the yellow band,

"MISS L." BERT CLARK THAYER

From the Members' Exhibit of The Camera Club, New York

the action was very slight, occasionally showing a light yellow. In the red, however, and little beyond it, I had a decided rose tint."

Sir John Herschel, in 1839, and Robert Hunt, in 1840, followed in Seebeck's line and got some hopeful results upon both metal and paper.

Draper, and others later, improved in these experiments. Fox Talbot mentions the reproduction of color, and Daguerre tells about getting the red bricks of a house in one of his iodized plates. Edmund Becquerel, the French physicist, produced some remarkable pictures in color on silvered copper plates, which he called Heliochromes. The plate was protected on the back by varnish to prevent the copper from having chemical action. It was suspended in a weak solution of hydrochloric acid by wires which were connected with a two-cell bichromate battery, the opposite pole being a platinum plate. Silver chloride was thus formed on the surface of the plate. The plate was then dried and heated until the film of silver chloride changed from white to rose color. On exposure to the rays of the spectrum, it reproduced more or less correctly.

Becquerel was followed by Niepce de Saint Victor, who also used silver plates with much improved results in reproduction of colored objects. Poitevin published a method which operated by alternate baths of silver nitrate and salt, where there was prevented an excess of the silver salt. The surface so obtained was excited to action by an alkaline bichromate and cupric sulphate bath presumably to absorb the chlorine liberated by the action of the light.

Wharton Simpson, 1866, came out with his collodio chloride of silver emulsion which showed the colors in a striking manner.

Kopp, in 1891, got a patent on a color process which is really only a modification of Poitevin's method. Dr. Wall in his recent work on Color Photography (1922), gives a full account of this method of Kopp, the study of which would be of advantage to any one experimenting in color work.

Our object here, however, is not to sketch out any course of experiment, but rather to stir up interest in investigation along a deserted path which may have presented many difficulties, but which is not deserving of neglect for the much more "primrose path," which seems now to have run its limits.

The Glow of Phosphorus

In connection with the studies of the light of the glowworm and firefly, made by Dr. Ives, and noted elsewhere in this issue, it is interesting to report the results of some investigations made by Lord Rayleigh on the glow of phosphorus. This phenomenon is due to oxidation, but a peculiar fact in regard to it is that many substances, even in small amounts, prevent the action. Camphor, ammonia and pear oil are, so far as determined, the most effective. Some hydrocarbons are also capable of stopping the action. Water vapor has the power of preventing the glowing if present in certain proportion, but Rayleigh found that a certain amount of water favors the action. Moderate drying of the air in which the phosphorus is placed produces a steady glow. The investigations indicated that the glow is not due to a wave of oxidation propagated from one point to the adjacent one, but that the action is more recondite, and due to the formation of nuclei somewhat similar in their physical action to that of a small crystal of a salt in a supersaturated solution of the same salt. The inhibiting substances are supposed to be capable of associating their molecules with the nuclei of phosphorus vapor and thus preventing the propagation of the oxidation. No report was made as to the spectrum of the light given off during the glowing.

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Historical Outlines

It is the general practice of writers in recording the history of any great invention or discovery, to attribute its inception to one or the other of the earlier experimenters, but rarely, if ever, does it happen that any single man invents or discovers independently of others laboring in the same field and, while we can hardly subscribe to the dictum of Solomon that there is "nothing new under the sun," it is the verdict in almost every case that an apparent novelty is only the climax of a series of experimentations or observations over a long time, made by kindred minds.

It is impossible, therefore, to definitely say who first noticed that certain bodies were changed in appearance on being subjected to the influence of light. Fabricus in the 16th century does mention the change effected in horn silver (native silver chloride) but Boyle, the eminent Irish chemist in the 17th century, is generally credited with as having particularly called scientific attention to the fact.

But certainly the ancients were aware of the phenomenon of the agency of sunlight in effecting a change of color in the famous Tyrian purple dye. From the time of Boyle, however, little of a scientific or practical value was announced until Schultze, of Halle, in 1727 attempted, by means of written characters upon a surface prepared with chalk and silver nitrate, to make copies of writing on a paper made translucent with some medium (the first photographic print).

Then there was another lapse until 1777, when Scheele, the famous Swedish chemist, did really give a valuable piece of information which afterwards bore good fruit. He took up the subject where it had been abruptly left, combining chemical and spectrum analysis and made known that it is the violet rays which are the most energetic in effecting the physical change in silver chloride, and, furthermore, the important fact that the silver chloride under the light action is decomposed, giving up a part or all of its content of chlorine.

Ritter carried further (1801) investigation of the behavior of silver in the spectrum and announced that the red rays had a reversing action on what the violet rays produced.

Wolloston, an English chemist, extended the information of the action of light on organic bodies on various gums, for instance, gum guiacum.

Professor Charles, a French school teacher, seems to have been the first photographer to take a portrait (1780). This was done at the Louvre. By means of a strong beam of light he threw a silhouette of one of his pupils upon a piece of paper dipped in silver chloride.

But all these attempts might have been continued indefinitely, resulting in nothing practical, mere records of physical interest to the scientist, and photography kept in abeyance had not the camera obscura been known. So a word about its discovery before going further.

This optical instrument had been waiting to be called into service since 1569, when Gambattista Porta gave it to the world.

It seems to have been considered more as an ingenious toy than a thing of practical value, used only by artists who needed assistance in drawing. Indeed such was its employment by Canalitti, a painter of the early part of the 18th century. He took a small edition of it on a sketching tour through Europe and his pictures do certainly remind us of camera landscapes, and so we may put him down as the first man to use a hand camera.

The lens Porta used was a plano-convex lens, the convex side being turned toward the ground-glass. The camera obscura of Porta is the great progenitor of our modern instruments, the first important move in the art of photography.

But no monument has ever been suggested to his memory, in fact, but little notice taken of this essential factor in photography. Subsequent improvements were made in Porta's camera, and Kircher in the 17th century even gives us an enlarging camera.

The Loss of Light in Lenses

When light passes through a lens it suffers loss from two causes—absorption and reflection. The absorption will depend on the nature and thickness of the glass; and, as photographers know, in some old lenses in which the glass either was always colored or has become tinted by the lapse of time, this may cause a very considerable loss.

In the lenses tested, which were modern and without perceptible color, it was found that as far as absorption is concerned it was possible to get a good approximation to the actual loss of visible light by taking it as 2.4 per cent. for each centimetre of thickness of glass measured along the axis of the lens. That is to say, that the glasses used in making photographic lenses absorb about 6 per cent. of the light for each inch of thickness. It will be seen that this is a very small affair compared with the losses due to reflection from the glass-air surfaces.

Photographers have long realized that, other things being equal, the fewer separate combinations there were in their lenses the better, the superior brilliance of the image given by a single lens being quite noticeable on the focusing screen. Each glass-air surface in the lens causes a certain loss of light by reflection, and here again, although the proportion depends upon the character of the glass and the angle at which the light falls upon the reflecting surface, it is possible to form a very fair idea of the total loss from such a cause by taking the loss for each glass-air surface as amounting to 5.22 per cent. of the light falling on that surface.

The bearing of this on photographic work can be seen by taking two imaginary lenses, one a single lens, which has only two glass-air surfaces, and one a modern anastigmat, which is composed, as many of them are composed, of four separate glasses or cemented combinations of glasses. This last will have eight glass-air surfaces. Allowing a loss of 5.22 per cent. for each of these surfaces, the total loss in the case of the single lens will be approximately 10 per cent.; in the case of the anastigmat it will be approximately 35 per cent. So that of the total light reaching the lens, one will transmit 90 per cent. and the other only 65 per cent. (ignoring absorption); or with the same stop, the exposure with a single lens needs only be about two-thirds (13/18ths is nearer) that which a four-glass lens would require to give an equally well-exposed result.

The loss by absorption will tend to make this difference still more marked, as the thickness of glass in most of the single lenses used by photographers is certainly not more than one-half the total thickness of the glasses in an anastigmat.

If these figures hold good with all photographically active light, we are led to the rather startling conclusion that an anastigmat with four lenses or combinations working at *f*6.5 is not appreciably faster than a single lens working at *f*8. It is true that very few single lenses work at *f*8 or anything like it, but it may well be supposed that when once the existence of so great differences has been demonstrated, lens designers, in their efforts to secure rapidity, will attach far more importance than they have hitherto done to reducing the total number of glass-air surfaces, since in this direction increased rapidity is not coupled with loss of depth of focus.

The subject is one which will no doubt have a good deal of attention in the near future, and is by no means as simple as it looks in the brief commentary which we have given. That the number of reflecting surfaces in the lens affects the exposure has long been recognized. Thus, in the Hurter and Driffield "Actinograph" we find that an exposure is given as, approximately, 8 seconds with a single lens, 9 seconds with a doublet, and 10 seconds with one of three combinations, which, it will be noticed, is very much the allowance which would be made from the figures given above.

To Test Einstein Theory of Light

Preliminary observations were made at Papeete, Tahita, in April and May by Dr. Robert Trumpler, assistant director of the Lick Observatory on Mount Hamilton, California, in preparation for final astronomical observations in northern Australia to prove or disprove the part of Einstein's theory of relativity, which has to do with the composition and characteristics of light.

Various astronomical expeditions will gather on the northern coast of Australia September 21 to take their observations when the sun goes into total eclipse. Dr. Trumpler's work here has been to photograph, on a large scale, the stars in that part of the heavens where the sun will be on September 21. On the day of the eclipse, when the sun is totally obscured

and the stars are visible, similar photographs will be taken on the same scale.

Einstein's contention is light is not, as scientists hitherto have held, the very rapid vibrations of the all-pervading ether, but is made up of electrons and therefore is a form of matter. If light is matter in any form it will be subject to the law of gravitation. It is to establish or disprove this point the observations are being made here and in Australia.

If Einstein's theory of light is well founded according to Dr. Trumpler, the rays of light from a star in that quarter of the heavens passing by so large a mass as the sun will be deflected by the force of the sun's gravitation and the star in question will appear on the photographic plate at a place slightly removed from its true position in a direction away from the sun's disk. The amount of this displacement, according to Einstein, should be, in a star at the edge of the sun's disk, 1.75 seconds of an arc, and in less proportion in other stars as their distance from the edge of the disk increases.

The two sets of photographs referred to will enable astronomers easily to detect these variations in apparent position. The plates made at Tahita three or four months before represent the true position of the stars, while photographs made at the time of the eclipse will indicate the variations, if any, due to the action of the sun's force of gravitation.

Superimposing these two sets of plates will detect with accuracy whether or not the rays of light from the various stars have been influenced by the mighty force of gravitation of the sun near which they have passed and so will prove or disprove that part of Einstein's theory. The preparations of Dr. Trumpler have been very complete, so all that part of the sun's disk will be accurately recorded and decisive results are expected from his investigations.

Damaged Lenses

A photographic lens, if treated with reasonable care, should remain in good condition for many years; in fact, more than an average lifetime. Many lenses bearing the name of Andrew Ross, who died in 1859, are still in daily use, and are in good working order. Some of the more modern lenses, owing to the use of unreliable glass during the period of experimentation in anastigmatic construction, show signs of surface tarnish, but, fortunately, these are comparatively few in number.

Yet there are many ways in which a lens can be ill-treated; in some cases the damage is irreparable; in others it can be more or less repaired and the instrument restored to its original usefulness. It is not recommended that any considerable trouble or expense be incurred with lenses of little value, as such can usually be replaced at less than the cost of repair, but good lenses, especially if of large size, are well worth attention.

While the amateur optician may effect certain improvements in the metal work of a lens, he is strongly advised never to meddle with the glass components, for he will probably find that after passing through his hands, the last state of his lens is worse than the first. All such work should be entrusted to a skilled optician, and if the original maker is still in business, to him alone should the lens be sent. Serious repairs are apt to be somewhat costly, but as a rule money so spent is well invested; even if the cost of replacing a damaged combination is half the original cost of the lens, it is cheaper than buying a new instrument. It must be realized that only the maker knows the exact quality of glass used for any particular batch of lenses, and the curves to which it was ground.

The most common injury to lenses consists of a general dulling or de-polishing of the exterior surfaces, or more or less distinct scratches or "digs," the latter being usually due to allowing the lens to knock about without protection in the camera case. The former trouble, though not so unsightly, is the more serious one of the two; if it exists it is impossible to obtain bright negatives, the diffusion of light from the dulled surface degrading all the shadows and often creating a false impression of over-exposure. This condition may or may not be easy to remove; in many cases, an application of the polishing tool and putty powder restores the original surface. Scratches are less easily dealt with. As they penetrate a certain distance in the glass, the surface has to be entirely re-ground and polished, which not only reduces the thickness (often an important factor), but alters the figure or curve. It may be necessary to explain that it is usual to grind a lens of slightly larger diameter than its ultimate size, and then to "edge" down the imperfect margins. Obviously,

this cannot be done with a finished lens, so that it is often necessary to cover the margin of a re-worked lens with a narrow metal ring which, while slightly reducing its rapidity, ensures perfect definition. But the scratches may be merely an eyesore, and do not appreciably interfere with the performance of the lens. If they are small they may be ignored, but if wide and deep it is advisable to rub a little black varnish or printing ink into them, so that they appear as black lines upon the surface instead of white ones. No traces of the black pigment must be allowed to remain except in the scratches. There is no danger of the scratches, when filled, affecting the negative. It may not be generally known that if a shilling be cemented on the centre of the front of a large lens, say, three inches in diameter, and an exposure made at full aperture, no sign of its presence can be found upon a negative. It is only when the size of the diaphragm aperture approaches that of the obstruction that it becomes visible, and such a condition cannot exist in the case of a scratch.

Conchoidal or "oyster-shell" chips sometimes occur on the edges of lenses. If ignored, these will cause a general fogging, but when painted out with black varnish become innocuous. Even a lens broken across the centre may be cemented together with black varnish and be made perfectly usable. If a transparent cement, such as Canada balsam, were used, there would still be a sufficient difference in refraction to cause a scattering of light.

Very often an injury to the cementing between the components of a lens is mistaken for a crack or chip. As a rule, if prismatic colors are present, this is the case, and the trouble can easily be removed by re-cementing, which can be done by anyone used to the work. It may be as well to state that the Canada balsam, as used by opticians, is very different in consistency from that used by microscopists or for cementing color filters, being a hard resin, liquid only at a high temperature and not a varnish-like liquid. A fair amount of skill and access to proper appliances is necessary if the contact is to be perfect and the glasses properly centred.

Lenses frequently receive injuries from falls, blows and other shocks which are not apparent to the eye, but seriously impair the definition. Glass is not the rigid, unyielding substance it is generally supposed to be, and when the brass mounting of a lens is bent or distorted, the strain which is put upon the glass upsets all the optician's calculations, and may turn the finest anastigmat into a "soft focus objective." It is therefore wise to test thoroughly any lens which has had a fall or any bad strain before using it upon an outdoor job. The condition produced is fortunately only temporary, and making a new cell or re-turning the old one is all that is necessary.

Nearly all the ills that lenses are heirs to may be avoided by providing them with cases in which they can be kept when not actually upon the camera. If this be not done, at least a well-fitting cap should be provided for both back and front cells. Rust or tarnish upon the surfaces, unless very bad, should be ignored; above all, no attempt to polish it off by hand should be made. It may make the lens slightly slower, but now orthochromatic plates are in general use, this will hardly be appreciable. Lenses showing any trace of this defect should be kept in an airtight case in as dry a place as possible.—*The British Journal of Photography.*

Members' Work at The Camera Club, New York

BY FLOYD VAIL, F.R.P.S.

The members' show at The Camera Club, New York, which was held from September 1 to September 30, 1922, surpassed any ever given by that organization, both in respect of number of entrants and pictures exhibited. All available space in the galleries was occupied and several members' prints remained unhung. The quality was excellent. The attendance and interest were unusual.

J. H. McKinley was represented by five specimens, two portraits—one of Stefansson, the explorer, and the other of "A Spanish Lady," besides a harbor scene and landscapes, and all presented in his usual superior style.

H. T. Leonard showed only one, a landscape of interest, breadth and linear excellence.

Charles I. Berg, an ex-president of the club, and formerly a prominent exhibitor at all salons, but who has been inactive for a long time, contributed six prints of high merit, all brush-developed platinums; and these attracted, and deserved, much attention.

W. E. Wilmerding afforded much pleasure with three fine prints, full of quality,

excellent in composition and finish—"The Lane," "A Roadside Brook" and "A Countryside"—will indicate their character by their titles.

W. N. Capen showed two examples—"An Old Sluiceway" and "Canal and Towpath"—resplendent in bright sunshine and very interesting, especially because of the rarity of subject.

M. W. Tingley offered six pictures recently made in Italy, three of which were particularly good, and all full of scenic interest.

Walter H. Close, a member of the print committee, was represented by six splendid genres, secured on a recent voyage to Martinique. Duplicates of two of these—"Sugarcane Seller" and "The Market Place"—were hung at the late Toronto salon.

Walter S. Gurnce, Jr., submitted two portraits in his well-known style.

Dr. Henry Kreuder's two prints were fine specimens of luminosity surrounded by juicy shadows.

H. Guillard had two excellent portraits, as did also Miss Gertrude Marks. The former excelled in modeling.

Dr. E. L'H. McGinnis was at his best in two prints—an autumn scene and a marine.

Sophie L. Lauffer showed two pictures—"Mrs. McGibben" and "A Long Island Clam Digger," which have graced other occasions and are good enough to grace many more.

William A. Alcock restricted himself to only two, these smaller than usual, but both up to his accustomed effervescence!

H. F. Bidwell made his debut with a *morceau* from Suffolk county.

J. J. Swain's portrait of a baby was one of the outstanding features of the exhibition. A. J. Shiels' well-known modesty impelled him to offer only one, but that one surpassed himself and was appropriately toned an emerald green!

Frank V. Chambers attracted much attention with "Mickey's Family," a *motif*, with nothing in the show in the same category. It was a fine example of posing, expressions, character rendering, and embraced other fine features.

Moses Joy held attention with three of his unique prints—"Old Cider Mill," "Milk Delivery — Quebec," and "Appomattox River, Virginia"—which were unusually interesting and finely rendered.

Bertrand H. Wentworth, of Gardiner, Maine, sent three charming marine and seashore studies.

Ben T. Lubschez showed "A Salon Jury" and an effective landscape titled "Vermont Hills."

Paul Strand contributed the most unique examples in the exhibition in his two aesthetic prints full of design and linear beauty, masterful in textures, and the last word in technique. His material was such as few would even think of noticing, let alone using, as it was most commonplace; and yet, through his artistic knowledge and his skill, his pictures were infused with an intellectual appeal that delighted the initiated and won the wonder or respect of all but the ignorant.

Floyd Eugene Vail was outstanding in his three portraits—one of Moses Joy and two of Esta Varez—these teaching a fine lesson in appropriate scale, pose, modeling and expression, and of subordination of parts for enhancing the whole.

George B. Biggs added to the show three studies in Kallitype and bromoil, exceptional in feeling of quietude.

Dr. Martin Degenhardt offered three well-rendered subjects that attracted much attention and well-deserved praise.

Burton V. Wolcott had three attractive prints—"Rain and Fog," "Windy Weather" and "Rain and Sunshine"—all successful attempts at rendering moods, and examples of skilful subjection of technique to expressing pictorial effect.

H. A. Latimer was seen as usual in his colored, multiple gums—recollections of bygone days!

Henry Galoupean took his first steps pictureward in bromoils, and many old workers in that process have not surpassed his results.

Esta Varez delighted with a fine profile of a young girl, a character study of an actor and a genre of a washerwoman, in a high key, toneful and excellent in lines and curves.

Benjamin L. Robinson had a collection of gum prints, carbons and chlorides which embraced some duplicates of his prints accepted at Toronto. His portrait of Conway Tearle was superb.

Warren R. Laity, of Oberlin, Ohio, sent four pictures secured during his last year's motorcycle trip through Europe. His "Bridge—Bruges," an unnamed landscape and "In Swimming" were exceptionally good.

Bert C. Thayer numbered among his exhibit an outstanding portrait of a young girl, and a child, and a study of lines embraced in a harbor scene.

Hal D. Bernstein showed four excellent and rich bromoil prints of landscapes, of which I liked best his "Orchard," and a countryroad scene with farmers and cows in dust, the title of which I do not recall.

John H. Keim was well represented by a bromoil print of good quality and artistic rendering.

Miss Eleanor Irving showed four portraits of merit and technical skill.

J. B. Temple's four prints of English scenes and architecture came up to his usually high standard.

Dr. T. W. Kilmer attracted much attention with his six multiple gum prints.

Karl Tausig did not fall behind his well-recognized high excellence in six delightful portraits.

Dr. J. B. Pardoe offered a variety of subjects—a nude of exquisite form; a harvest scene; a moonlight; an effective head of an eagle and a fine portrait of a lady, entitled "Bitter Sweet,"—all well done and attractive.

Nickolas Muray adorned the walls with a half dozen specimens of his characteristic studies; finer, if possible, than heretofore. In two of his dancing figures he certainly surpassed himself and made his panel the cynosure of all eyes.

No amount of description and analysis would do justice to this members' show. It was well worth attending and studying.

The Use of Boric Acid in Photography

Ernesto Baum, remarking in *Il Corriere Fotografico*, that photochemical laboratories are just now very quiet, seeks to enliven the dull season by discussing some of the applications of boric acid in ordinary photographic work. The comparatively recent announcement of the desensitizing action of phenosafranin, is, he says, about the only epoch-making incident since 1904, when the Lumières gave the first exhibition of their autochroms, which are dependent on the three color selective principle announced by Ducos de Hauron in 1886. Without doubt interesting discoveries may be expected in the future, among which will be a simple process of making colored prints.

In the absence of any striking recent discoveries, thoughts may revert to earlier procedures, which though useful, have been in a measure forgotten. Among the substances that have been proposed, but are not in general use by photographers, is boric acid, which really has several useful applications. It is obtainable at low price and is found in two forms, crystalline scales and powder, the latter being preferable as being more readily soluble. A solution in water, four parts to the hundred is satisfactory. Solution can, of course, be effected more rapidly by using hot water, and if an excess of the acid is added, this will separate on cooling. Boric acid has a very low acidity. This is due to extent to which it "ionizes," that is, to the proportion of hydrogen atoms in it which assume a distinct positive charge. Notwithstanding its low acidity it has a restraining action and is also antiseptic, so that it adds to the keeping quality of the solutions containing it.

Namias has recommended its use in developers to compensate for over-exposure, adding it in proportion of 5% to the usual 10% solution of bromide. This solution keeps indefinitely and can be readily employed to retard development. He recommends it especially for the development of landscapes, interiors and all cases in which full exposure has been deemed necessary to avoid lack of detail. Baum says that the acid has also a tendency to moderate contrast.

The addition of the acid to the fixing bath is recommended. Namias uses 50 parts to 400 of hypo, stating that the bath remains clear for a long while and does not stain the high-lights of either bromide or chlorobromide paper, and can be used until it is practically exhausted. Other uses of boric acid are to be found, among which is that of an antiseptic to starch jelly which spoils so easily.

The P. P. A. Record of Photography

We have received the initial number of *The Record of the Professional Photographers' Association of Great Britain*, up to the present time the only publication in Great Britain which is exclusively in the interest of the professional photographer.

The P. P. A Record is published monthly, and this first issue sets forth the special purpose of the periodical and gives insight along the line in which it shall be conducted. Its one distinctive aim is to be helpful in the broadest possible way to the profession at large.

An interesting review of the portrait work of Pirie Macdonald by Marcus Adams is presented, together with several other interesting papers or topics of value.

Exposition of Photography at Geneva, Switzerland

An international exposition of photographic apparatus and photographic supplies, open to Americans as well as Europeans, will be held in the galleries of the Palais Electoral at Geneva, Switzerland, from May 11 to 21, 1923. This exposition will be held as an adjunct to the Swiss National Exhibition of Photography, which will take place in the Palais Electoral at the time mentioned. The national exhibition will conprise three sections, as follows: Professional photographers, amateur photographers, and former professional employers and employees and professional employees actually in service.

In addition to the national exhibition, with its three main sections, a historical exposition, dedicated to the memory of Daguerre, will be organized in the reception room of the Council of State, and a fourth exposition, comprising all materials relating to scientific, documentary, and judiciary photography, is contemplated.

Conferences, general assemblies, and meetings of the principal Swiss photographic associations are planned, and great interest and attendance are expected from all engaged in photographic and allied lines. Americans desiring to obtain further information regarding the exhibition of apparatus and supplies, which is open to others than Swiss, should address the Directeur de l'Exposition Nationale Suisse de Photographie, 12 Boulevard du Théâtre, Geneva, Switzerland.

Desensitizers for Prevention of Halo

Max Schiel, in *Photographische Rundschau*, gives formulas that he has used successfully for preventing halo, employing the now well-known desensitizers, especially phenosafranin. After reviewing the usual methods for backing plates, and making a number of experiments, Schiel devised the following mixtures:

Rosin	4 parts
Strong alcohol	30 "

The solution is to be promoted by warming, which should be carried out in a water bath. It will be best to pulverize the rosin. When solution is complete, the following should be added.

Strong solution of sodium hydroxide	2 parts
Phenosafranin	3 "

This mixture should be swabbed on to the back of the plate, which for protection of the emulsion, should be laid on a clean sheet of paper. Blowing on the solution, or better, using an electric fan, causes a rapid evaporation of the solvent, but the setting of the dissolved substances does not occur at once, since a certain amount of rosin soap is formed. This, however, dries much more rapidly than some other backing mixture, such as dextrin solution. The deposit from the proposed solution adheres well to the plates and slowly dissolves in the developer, setting the phenosafranin free, which then begins its desensitizing action. The newly introduced pinakryptol green is also soluble in alcohol and may be used instead of phenosafranin. Presumably denatured or even pure methyl alcohol may be used for making the solutions.

Dextrin solutions may be also impregnated with the desensitizer. The following formula is serviceable:

Water	70 parts
Dextrin	5 "
Ammonium chloride	1 "
Burnt sienna	1 "
Phenosafranin	0.5 "

A light coating serves the purpose and dries more quickly. The amount of mineral color is too small to constitute an interference in the development.

Green Toning with Vanadium

Vanadium was long considered one of the rarer metals, but of late years it has been much used in the manufacture of certain high grade steels. Its use in other lines has been rather limited, but Jean Spitzmuller, of one of the French Research Laboratories, has given attention to the employment of vanadium chloride in toning. His results appear in *Photo-Revue*. He mentions the toning methods commonly used, but says that none give a green tone. Such a tone may be useful in views under trees and in marine scenes. Uranium has been recommended, but results are not always satisfactory. Often the tone is much redder than wanted and the whites are muddied. Cobalt chloride would be expected from a theoretical point of view to serve the purpose, but it does not. Some other salt, especially in association with an iron salt, must be used. Investigations were, therefore, undertaken and entire satisfaction was obtained by the use of the vanadium salt. Further gratification was found when it was discovered that, by vary-

ing the proportion of the salt, a range of toning effects from blue to yellowish green can be obtained. The principle of the action is simple. A single solution is used, in which a blue iron ferrocyanide is associated with a yellow vanadium ferrocyanide. The combination of these tints gives green. If vanadium chloride is used alone as a toning agent, the tint is yellow. The following solutions are employed:

A.	Water	1000 parts
	Oxalic acid	15 "
	Ferric oxalate solution	1 "
	Ferric chloride solution	1.5 "
B.	Water	1000 parts
	Potassium ferricyanide	4 "
C.	Vanadium chloride solution	2 parts

A and B are to be mixed when about to be used and C to be added at once.

Unfortunately, in accordance to the too frequent custom of our French co-workers, the solutions recommended are not as clearly defined as they should be. The ferric oxalate solution is stated to be of 25° B which corresponds to about 1.2 specific gravity. The solution of vanadium chloride is given as the commercial solution in hydrochloric acid. Vanadium chloride in solid form is quoted at $1.00 per ounce, so that the solution will not be expensive. The addition of the vanadium salt to the solution will produce a green precipitate, which should be disregarded. Reducing the amount of vanadium causes, as noted, a change in the tone towards blue, while increasing the dose of vanadium will carry the tint towards yellow. Greenish-yellow tones are, however, obtained at some sacrifice of the vigor of the image. The real tone is obtained only after the final washing, which can be prolonged for some time without danger, indeed the coloration on the whites will usually require a good washing to clear up. With proper management, very good results can be obtained. The method is economical as the only expensive substance, the vanadium salt, is used in very small amount. Images produced by double salts of silver are less stable than those by silver alone, but in this case the keeping quality of the picture is fair. In the case of lantern slides, these being usually kept out of light and exposed only briefly in the lantern, they will keep well. It is necessary to be rather exact as to the proportions used, a point which will be somewhat difficult to attain with the incomplete description given by the French writer. The mixture, as made for use, will not keep; it must be used promptly. It stains the fingers. Stains accidentally acquired may be removed by vigorous use of soap and water. During the toning the dish should be kept in movement, in order to prevent the precipitate from collecting unequally. Transparencies may sometimes show, when observed at a particular angle, a little veiling in the high-lights, but this will not show on projection. Lack of complete washing after fixing may be the cause of this, but prolonged development may also be at fault.

Some Experiments with Desensitizers

In a recent number the advantages of pinacryptol green as a desensitizer were extolled, and therefore I have thought that the results of some practical experiments might be useful.

Half a gramme of this dye was dissolved in 8 ozs. of distilled water, making a solution of 1:500 with sufficient accuracy. A further dilution to ten times the volume makes the working solution. Thus 80 ozs. of solution is available at the cost of 2s. 8d. for the dye, which, in small quantities, is more expensive therefore than phenosafranine.

To test the staining properties, the emulsions which had given most trouble with desensitol, *i.e.*, phenosafranine, were used, and a first test was made with Wellington double-coated anti-screen plates.

Four plates from the same box were taken, and after exposure two were placed for one minute in desensitol, and two for the same period in pinacryptol green. All four were given a rinse in plain water, and were developed together in a dish with pyro-soda, without bromide. The illumination was a Wratten OO safelight, which is a very bright yellow. There was no appreciable difference in the time of development, and the plates were fixed in the normal way with a hypo fixing bath made up with potass. metabisulphite. The two plates desensitized with pinacryptol green were free from visible stain as soon as they were fixed; the other two were badly stained. One of these, placed immediately under a tap, so that water in some volume ran directly over it and away, took 2½ hours in such favorable conditions before the stain appeared to be removed. Swabbing with cotton wool showed that the dye had not been completely eliminated, though the plate was clear for all practical purposes. The other was placed in a dish, so

that water flowed in at one corner and out at the corner diagonally opposite, the flow being sufficient completely to clear the water, which was dyed for the purpose, in about ten minutes. In such circumstances eight hours were required for the discharge of the dye. Of course, by the use of a fixing bath containing acetic acid or by the use of an alum bath after fixing, the time could have been much shortened.

Repetition of these tests, using D50 as a developer, did not give any material alteration.

The other material which has given the writer some trouble with desensitol was film, both flat films and filmpacks. Similar experiments were tried with a filmpack. Pinacryptol green gave no stain; the pink stain with desensitol was most persistent, and one film, which was probably in the solution for longer than the rest, was still appreciably stained after 36 hours' washing in running water and 3 days' soaking with occasional changes. It would seem, therefore, that in the cases mentioned some procedure other than plain washing is necessary. The writer has developed many films and double-coated plates after desensitol, and has found that, to avoid staining as far as possible, it is necessary not to exceed the time of immersion of one minute, to give the film a couple of baths of plain water for a minute each before development, and to use a fixing bath with acetic acid (the Kodak acid fixing formula is successful). If necessary, an alum bath should also be used after fixing and partial washing, and from this stage hand washing, *i.e.*, having the films in water and frequently changing, is more effective than running water in any reasonable volume. It should be noted that both methylated spirit and formaline will help to discharge the dye, but if the procedure outlined above is followed there should be no need to use them.

Both dyes will become less effective with constant use, and it is advisable to filter through cotton wool at each time of pouring back into the bottle and not to be too particular to pour back the last dregs. Also the solution should be kept up to a constant volume by the addition of fresh from the stock bottle constantly. In this way the solutions can be used with safety and economy.

Ilford and Wratten panchromatic plates developed by candle light showed no difference, the pink stain of the desensitol being readily discharged with ordinary washing, though the plates are always twice rinsed in water before development. For some unexplained reason the earlier batches of double-coated plates desensitized with pinacryptol green were not so clean as those developed at the same time, and treated with desensitol, and the skies were rather badly marked with semi-transparent spots. It is not clear that the desensitizer had anything to do with this, but actually one of a pair of plates with the connecting film unbroken when taken out of the box showed this defect in the green dye, while the other did not in desensitol. Both plates were exposed at the same time, and were taken straight out of the Mackenzie-Wishart envelopes for simultaneous development. Latterly, however, it has not been possible to repeat this trouble, which appeared more than once.

A trial was also made with bromide paper, which had one minute's immersion in the green dye, and was then developed within 3 feet of a medium-sized, inverted incandescent gas burner with success. Normal washing removed any stain. It is not thought that this use will have much application, though it might on occasions be useful for the demonstration of development of a bromide print before a number of persons.

The writer concludes that, for all ordinary purposes, pinacryptol green is less trouble to use, but the stain of desensitol being readily removed by ordinary washing there is no real practical advantage. For films and double-coated plates the former has great advantages. It is interesting to note that desensitol acts as an indicator of proper fixation; the double-coated plates take a very long time to fix, and once or twice they have been removed before fixation is finished. In such circumstances no account of washing will remove the stain where the silver is not fixed out, but this part will assume a brownish appearance. On re-fixing, the characteristic pink stain re-appears, and is then readily removed by washing.—A. H. HALL, *in The British Journal of Photography.*

News of The Camera Club

At The Camera Club, New York, during the month of October, 1922, there will be a loan collection of prints, the work of foremost workers in various foreign countries, from the permanent collection of the Smithsonian Institution—U. S. National Museum, Washington, D. C. The public is invited and admission is free.

Phenosafranin in the Developer

The discoverer of the densensitizing powers of phenosafranin, found early in his experiments that it could be combined with some developers, but that many of these when in concentrated form, will precipitate the color in flakes. This is, however, not an objection, as on diluting the liquid, the color redissolves, and the developer is ready for use. In such case the plate is immersed in darkness and kept so for a minute, when it will have been sufficiently desensitized and the stronger light can be turned on. The details of this method are presented in a translation from Italian sources in *Photo-Revue*. Lüppo-Cramer has proposed two forms of combination bath, one rapid and the other slow. For the former the rodinal type serves well, and the following formula is advised:

A.—Water	125 c. c.
Potassium metabisulphite	50 grams
Amidol	20 grams
Potassium bromide	4 grams
B.—Potassium hydroxide (Caustic potash)	70 grams
Water	100 c. c.

The caustic alkali is dissolved in the water, but care must be taken, as this solution produces a good deal of heat and a thick glass vessel, such as a common bottle will be broken. The water should be in a beaker, and the alkali added in comparatively small portions. The stick potash sold by dealers in chemicals is most suitable. It should not be handled by the unprotected fingers. When solution is complete, the beaker should be covered by a glass plate or large watch glass and the liquid allowed to get cold, when it is added to solution A. The mixed liquid will become quite warm. It must again be covered and allowed to cool, after which it is filtered through asbestos or glass wool. Filter paper cannot be used. After filtration, a solution of 1% of phenosafranin is added in the proportion of 10 volumes of the color solution to 200 volumes of the concentrated developer. A turbid solution will result which should be kept in bottles that are filled, the bottles being preferably of such size as to contain just the amount of concentrated solution that is likely to be used at one operation. For use the concentrated liquid should be diluted with 20 times its volume of water.

The slow development is carried out with glycin paste. 50 grams of potassium metabisulphite and 30 grams of glycin are intimately mixed in a large mortar; 200 grams of dry potassium carbonate are then added and thoroughly mixed. 180 c.c. of water are added in small portions mixing well after each addition. In the paste thus obtained 25 c.c. of a 1% solution of phenosafranin are incorporated uniformly. By mixing one part of this paste with 20 parts of water a rapid developer is obtained, but by using more water the action is slowed down, the slowing being greater as the dilution is increased. If, however, high dilution is used, it will be necessary to increase the amount of desensitizing color, so as to keep the proportion about 0.1 gram to 1000 c.c. (1.5 grains to the quart.)

The Pioneer of the Gum-Bichromate Process

R. R. RAWKINS

There seems no doubt that the pioneer of the Gum-Bichromate process was Pouncy, a professional photographer, of Dorchester, although some two years before his process was actually published, a patent was taken out in England by a Frenchman, Poitevin, for a rather vaguely worded process. The action of light upon bichromate in conjunction with organic matter was known for many years before Poitevin patented his process, but it was left to Pouncy to put it in practical form.

In 1858, Sutton, the Editor of *Photo Notes*, tried to induce Pouncy to publish his process, and this Pouncy agreed to do for a remuneration of £100. *Photo Notes* opened a subscription list to obtain this money, and the list was headed by the Prince Consort with £10. Pouncy published the particulars and was later awarded a silver medal and 400 francs by the French Photographic Society.

The process was, however, doomed to failure, or at any rate it failed to obtain general favor, owing to the discovery of Swan's Carbon Process. The Gum-Bichromate process remained in obscurity for 40 years, but was revived by some amateur photographers, who found in it a means of artistic expression, and was considered to be a "plastic" process. The method as evolved and practiced by Pouncy was a "straight" one, and I believe he did not contemplate using a brush as a means of control.

Demachy, Puyo, Mummery and others worked the process enthusiastically and produced splendid results. M. Demachy, the apostle of the process, read a paper at

the R. P. S. in 1898, in which he stated that the process presented no advantage over other methods of exact reproduction, but its usefulness consisted in allowing modifications of tones and values by means of development and brushwork "more than other processes."

Demachy and Mummery practiced the multiple printing method, and I always regarded Mummery's work as the acme of perfection and artistic restraint. He was, however, somewhat fond of added handwork on his prints, but being an excellent draughtsman, the "work" was usually skilfully done and could not be detected.

The process was regarded by many as being crude, and only suitable for broad effects, but I have seen many examples of ordinary "straight" prints (developed by simply floating face down in cold water) which equal any platinum print in detail and sharpness, and actually superior in texture. Some 20 years ago, two members of the North Middlesex Society (Mr. Cox and the writer) showed examples of gum prints which were taken by many to be rough C. C. Platinums.

A relative of the writer served a short apprenticeship with Pouncy at the time when he was producing very large pictures ("life-size" he called them) by his process. Pouncy was very reticent as regards the coating and exposing of his paper, and always did this part of the work himself. The large pictures were mostly produced by a solar enlarging-camera, and it is worthy of note that Pouncy realized the advantages of multiple-printing and undoubtedly practiced the method. He scarcely ever used a brush for developing; in fact, he did not advocate it in his published process.

His pictures were full of delicate detail, and his practice was to place the exposed print face down in clean cold water, with corks clipped to the corners and a sheet of glass placed on the back to keep the paper covered with water. Development was allowed to proceed spontaneously, in some cases occupying a whole day, but usually about five hours. He always locked up his developing room after placing his prints in the water.

Pouncy's large portraits are still to be seen in many of the old Dorset family houses and manors, and show very little deterioration. In some cases the "working-up" has faded, but the original pigment image remains—*The Club Photographer.*

Some Advice on the Subject of Copying-Work

Although no copy of a paper print can ever be quite as good as the original, if the work has been properly done the difference between them ought to be so slight, as not to be noticeable, while if the original is a faded, yellowed, silver print the copy in some respects may appear to be the better. Many of the copies which are made are nothing like as good as they should be.

The conditions of success are (1) proper illumination, (2) accurate focusing, and (3) correct exposure and development, and it will be well to consider them in that order, which represents, moreover, the order in which the problems of the work present themselves.

Upon proper illumination of the subject far more depends than might at first sight be supposed. The surface of a print is not perfectly smooth, but is broken up into countless little hills and valleys. This holds good even of prints on "smooth" or "glossy" paper, still more of the matt or rough prints which are more commonly met with. Then, again, many professional prints have been carefully "spotted" with pigment to hide any little defects, and while such work may be quite invisible if the lighting is right, if it is wrong the spots may stand out more distinctly than anything else in the print.

For convenience in focusing, the original should be fixed in a vertical position, preferably upside down; and if it cannot be kept flat in any other way, it may have a piece of glass fastened over it. If the print is on a gelatine coating of any kind, and there is no objection to wetting it, a particularly fine grainless surface may be given to it by soaking it in water, squeegeeing it face downwards on a piece of clean glass, and photographing it through the glass. There is no need to wait for it to dry.

To emphasize irregularities of surface, every photographer knows that a strong side light, coming from one side only, is best. Therefore, *per contra,* to minimize irregularities we must get the illumination from the front as much as possible and falling equally from both sides. Just inside the window of a room, with the subject one side of the window and the camera the other, is the worst possible place in which to do copying work, even the slightest irregularities of surface will be shown up. On the other hand, one of the best

places is to have the original just inside the window and facing it, and the camera outside. Out of doors is a good place for copying, especially if there is something some little distance overhead to cut off the excess of top light; but in windy weather when working out of doors we may get trouble with movement of the original or even with vibration of the camera.

It will be found much easier to do copying work if the original is fastened by means of drawing pins to the side of a box, and the box itself is placed on a table, on which the camera also is placed. The original is fixed at such a height that its centre is exactly on a level with the centre of the lens. If it is too big to allow of this the camera must be placed on a block of wood or other support so as to bring it up to the required height.

When there are several lenses available, the photographer may be tempted to use one of short focus in order that the camera extension may be kept down, but unless this is an absolute necessity it should not be done. Wide-angle lenses cannot illuminate the plate as evenly as those which for the same size are of longer focus, and in copying work even illumination becomes important. It is generally necessary also to stop down a wide-angle lens more than one of medium or narrow angle; and although in most copying work the exposure does not have to be cut down to a minimum, there is a feeling amongst those who have much copying to do in favor of large apertures and short exposures.

A rectilinear lens must be used, or the original will be distorted. By rectilinear is meant any lens that is non-distorting, and not merely one of the types known as "rapid rectilinears" or "wide-angle rectilinears"; in fact, an anastigmat of any modern pattern—all of them are rectilinear in this sense—would be a better copying lens than the "rectilinear," so-called, since the latter necessitates a smaller aperture if it is to give a perfectly sharp image right up to the corners. The writer has an anastigmat which at *f*6 will give a better image over the whole of the plate than a really first-class rectilinear will give unless it is stopped down to about *f*16.

Focusing in copying seems to puzzle some workers, who do not for the moment realize that when the work is being done at such close quarters a very great extension of the camera may be needed, far more than under ordinary conditions. The distance between the lens and the object is so short that racking the lens in or out appreciably affects its distance from the object. The writer has known of a case in which a photographer trying for the first time to do some copying has failed to get a sharp image after half an hour's focusing, because of this. Of course, nothing like so long need be spent over such a task if the fact that moving the lens not only varies its distance from the groundglass, but also from the subject, is borne in mind. It is for this reason that when there is much copying to be done it is worth while getting a camera which has its front fixed and focuses from the back.

One of the first things which the photographer who is confronted by a copying task has to determine is on what scale his apparatus will render the image. If he wishes the copy to be the same size as the original, then his camera must be able to extend twice as far as it usually does when landscape or similar work is in progress. It must therefore have "double extension" at the least; if it has triple extension, so much the better.

By racking out the camera as far as it will go, and then focusing by moving it to and from the original, we learn the greatest scale on which work can be done with that lens and camera, which is that of the image when it has been made sharp in this manner.

The simplest method of focusing is to rack the lens to what is thought to be about the correct position for it, and then to move the camera to and fro until the image is sharp. If it is then not on a large enough scale, the lens is racked out a little and the focusing is repeated; if the scale is too large, the lens is racked in.

As the original in copying work is almost or quite flat, it is of great importance to have the front of the camera quite parallel with it. A simple method of securing this result is to focus with the full aperture of the lens, and note if all four corners are equally sharp at the same time. If they are, the camera may be assumed to be parallel with the subject. Unless the lens is a flat field anastigmat, we shall not get both centre and corners sharp with full aperture; in fact, we may have to stop down the lens a good deal. The best general focus should be ascertained with the full aperture, and then stopping down the lens a little at a time, the image should be

refocused, until at last it is sharp all over. As already pointed out, this should be obtained with as large an aperture as possible.

Magazine and other cameras which have not sufficient extension to allow of copying on a large scale with the lens already fitted to them can only be used for this work by adding to the lens a copying magnifier. This shortens its focus sufficiently to allow it to be used. The magazine type of camera, however, is the least suitable outfit for work of this kind that can well be devised, not only because of its limited extension, but also because of the absence of a focusing screen.

The exposure must be ample or sufficient vigor cannot be obtained in the negative no matter how long development is carried. An exposure meter is the only reliable means of determining how long to give; but those who have not got one of these invaluable instruments can make a trial exposure, pushing in the shutter of the dark slide a little at a time so as to obtain a series of different exposures on the one plate, developing and fixing this, and then making a second exposure in the light of the information gathered from it.

Where there is a great deal of copying work to be done it is worth while getting a supply of slow, or "landscape" plates, and learning how to use them for the purpose; but excellent copies may be made on the rapid plates used ordinarily for hand camera and similar work, and for occasional use it is better to employ that with which one is accustomed to work. For copying, backed plates offer a great advantage. Orthochromatic, and, in some cases, panchromatic plates give better results than ordinaries, although in others, particularly with faded silver prints, non-orthochromatic plates are much to be preferred. Regular copyists make great use of such differences, but the photographer to whom the making of a copy is merely a very occasional incident will find he will do best by working throughout with the materials to which he is accustomed.—*Photography and Focus.*

The Uvachrome Process

Some particulars of the process which has attracted a certain amount of curiosity on the Continent are given in the Festnummer of *Photographische Korrespondenz* by its inventor, Dr. A. Traube, of Munich. The process is one of dye-toning, in regard to which Dr. Traube refers to his patent of 1907, in which silver iodide, obtained by bleaching the silver image with iodine, was the mordanting substance. Apparently he claims to have been the first to have employed copper ferrocyanide in place of silver iodide as a dye mordant. He dwells upon the variations in the composition of the bleach of sulphate and potass. ferrocyanide, which may be made for the purpose of securing any degree of transparency or opacity in the dye-toned images. Moreover, the dyed copper ferro-cyanide image is susceptible of being intensified or reduced within considerable limits. These properties of copper ferrocyanide are the base of the process.

In practice, a set of three negatives is made on Uvachrome film, viz., cinematograph film coated with a special emulsion. Soft transparencies are printed by contact, and treated in the copper bleaching solution. After washing for 5 or 10 minutes, they are dyed in colors complementary to those of the respective taking filters, by means of special Uvachrome yellow, red and blue dyes, this operation requiring about 10 minutes. They are then treated for about half a minute in a clearing bath and washed. The clearing bath is chiefly of hypo, by which both the copper and silver ferrocyanide are dissolved out. After a further wash of 10 to 15 minutes the separate component images are dried, and are ready for assembling.

Before mounting, however, the three films are brought one on another on a glass plate, and temporarily fastened together in register with clips. By this means the effect of the final result may be judged. If the negatives have been correctly exposed and printed, the color rendering will be correct, but, as required, modifications can be made in the component dye images, any one of which may be reduced in depth by a bath of weak acetic acid or strengthened by a dip in the original dye solution. Dr. Traube does not say how the three transparencies of practically postage-stamp size are permanently superimposed in accurate register.

At present the process is adapted only for the making of three-color transparencies, but it is hoped to apply it also to the making of paper prints. It is stated that thousands of the transparencies have been made, and that the percentage of throw-outs does not exceed 1 per cent. to 2 per cent.—*British Journal of Photography.*

Influence of Various Degrees of Color Contrast

The phenomena of contrast have been the study of painters consciously from experimental study or the effect has been intuitively worked out.

The effects produced by color contrast rest precisely upon the same deception of judgment which we experience in the study of colored shadows.

The intensity of the contrasting color is materially influenced by the quantity of white light present. No contrasting color can develop itself upon perfectly black surfaces. A mixture with it of white light is absolutely necessary to produce it.

If, however, the contrasting color is to assert itself vividly, it will not be sufficient to change the reacting black surface to gray by an admixture of white light, but a similar change in the inducing color surface will also be found to be of advantage. Colors of a lower degree of fullness; that is to say, pale and broken colors, and colors inclining toward darkness exhibit the phenomena of contrast more vividly than full colors. This general proposition explains the effect of color of mounts upon the tone of the superimposed photograph, since all our colors employed in tinting card mounts incline to dark rather than to the full color. We rarely, if ever, mount upon a decided color. Full colors force their hue upon us so powerfully and so ambiguously that no room is left for deception of the psychological judgment which forms the basis of the phenomena of simultaneous contrast. Thus, we see the role played in broken colors. Such colors do not exert the fatiguing effect of successive contrast, but they call forth more than any others the insinuating effect of simultaneous contrast which is prolific of illusions.

An artist who works with full unbroken colors, therefore, deprives himself of one of the most potent means for producing illusion by aid of simultaneous contrast.

The fact that the phenomena of simultaneous contrast will not appear very vividly unless there is an admixture of white light, may be shown in the following way, which puts the vivid original color pretty much in the condition we have when it is depressed in tone for use in the ordinary card mount. The experiment is well worth trying.

If we lay a small piece of black paper upon a colored ground, we shall, at the best, see only a very faint tinge of the contrasting color upon the surface of the black piece of paper, especially if the paper is dull and without lustre. But the contrasting color is perceived immediately when we cover the whole with a piece of translucent tissue paper.

Instead of a piece of black paper we can put a black and white engraving, having much contrast of masses of black and white.

This fact shows us how much influence depressed colors have where mounts of such hues are employed in supporting our photograph, say, for instance, a rich black platinum. Black figures, for instance, upon a violet ground, will show a strong tinge of yellowish green if the black image is glossy; but if matt or dull the black is not so much altered.

Green, blue and violet, the so-called cold colors, will originate very vivid contrasting colors. While this is the case to a much less degree with red, yellow and yellowish-green. But the experiment is so easy to test and we recommend you to judge for yourself. Our purpose here is to touch briefly upon the fact that the tone of the mount has a decided action upon the tone of the superimposed photograph.

Want of Sharpness in Enlarging

When an enlargement does not show as good focus as is required the blame is generally put on the negative without any further consideration, though, as a matter of fact, there are several other possible causes of trouble connected with the process of enlargement itself. It is obvious that a good lens must be used. One that gives a flat field and is well corrected for chromatic aberration is essential, while it is also necessary that it should cover a sufficiently wide angle with good definition. Here, however, we come to one cause of trouble that is often unsuspected. The lens may be capable of doing everything required, so long as it is quite central with the negative, while imperfect centering may bring the image just outside the limits that the lens will cover perfectly. In lanterns fitted with sliding carriers it is often easy to get the negative well out of the center line, and if a fairly short focus projecting lens is in use trouble ensues at once. The centering should, therefore, not only be checked to see that it is correct, but stops should be fitted either to the lantern or carrier so that the latter may always be put

directly to its proper central position. When short focus portrait lenses are used as projectors, bad centering is a far more frequent source of trouble than many people are likely to suspect.

A more obvious cause is looseness of the carrier or of the negative in the carrier. The negative should always be held in correct register by spring clips, while the carrier should fit so closely as to leave no room for shake, spring bearings being very desirable. It should be possible to change one negative for another without disturbing the focus in the least, and this is quite easy if the carrier is well fitted and if it is rebated on the right side. We have seen lantern carriers rebated on the wrong side, so that when the plates were changed correct register was preserved only from the back of the plate and not from the film. Naturally the register cannot be correct in such cases, and lantern makers seem to have at last realized this point.

Buckling of the paper on the easel is another common cause of unsharpness, which we are dealing with separately; but there are also three other factors that are much less obvious, and, therefore, more insidious and more prolific of bad effects. The first of these is vibration. If the lantern is put on a table and the bromide paper pinned to the wall of the room it is barely possible to avoid vibration, excepting in very exceptional circumstances. If the house is exceptionally well built, and there is no traffic near and no wind, everything may work perfectly; but unless all these conditions are fulfilled there is bound to be a certain minute amount of vibration, which is only detectable by some delicate test such as that which we apply when we attempt to enlarge in the way described. It is not the fact that vibration exists which causes the defect, but that the lantern and the paper are vibrating independently and out of unison. If we can make them vibrate together then focus will not be disturbed. There are two simple expedients between which we can choose. One is, do not use a separate table to carry the lantern, but put the latter on a shelf fixed to the wall. The other is to use a separate easel, and stand lantern and easel both on the same table. Either method will serve well in ordinary circumstances, while in extraordinary circumstances, when the effect of very heavy traffic is to be guarded against, we can get over all difficulty by suspending the table from the ceiling by ropes or chains from its four corners. In photomicrography this is often an essential expedient, though the apparatus being smaller a stiffened plank or baulk of timber can well take the place of the table. If the shelf idea is adopted the most effective method is to have a marble or slate shelf built into the wall. Such shelves can be bought cheaply at sales, and we have known one to be used quite successfully in a place where railway traffic was almost incessant quite close to and on several sides of the building.

The next most insidious cause of want of focus is dust, or condensation on either lenses or negative. Dust should not exist, and if condensation does exist it is a sign of deficient ventilation, and the remedy is obvious.

The last condition affecting focus that we propose to mention is the light. Very few realize that imperfect adjustment of the light in the case of a condenser system invariably causes the focus to deteriorate, and very frequently the necessity of readjusting the light when the scale of the enlargement is altered is quite forgotten. When the right scale is settled the negative should be removed for inspection of the disc before any attempt is made to secure critical focus, and if this precaution is neglected unsatisfactory definition must be expected sooner or later.—*The British Journal of Photography.*

Marine Glue

Photo-Revue gives the following method of repairing this strong adhesive, suitable for many purposes, being waterproof. Pure rubber is dissolved in commercial benzene (the coal-tar product, not the so-called benzine obtained from petroleum), in the proportion of 4.5 parts of the solid to 180 parts of the solvent. Solution will require a week or more, during which, of course the vessel should be kept tightly corked. The rubber does not form a perfect solution, but becomes a rather thick cream-like mass. When this condition is reached, 3 parts of shell or stick lac are added to one part of the solution, the mixture cautiously warmed and then poured into molds. The warming should take place in a water-bath away from fire as the vapors of benzene are highly inflammable. The mass must be warmed in boiling water when it is to be used. It has very high adhesive power. When applied to wood, this should be well dried beforehand.

A Word Relative to Color Photography

We hear a good deal of argument about the character of the modern scheme of translating by photography the colors of Nature. Many aver that the solution of the problem is by no means reached, and that the colors are only a result of skillful application of artificial pigments and not the actual translation of the tones and tints of Nature.

Well, if we look at it in this way, we may reasonably conclude that the reproduction of Nature will never be accomplished by photography. Photography is an art, and as an art must use, like the painter does, artificial means to convey truth. We do not object to the painting because the pigments are chemical substances. Why demand of the Photographer what is only possible by process of physical reflection, say, in a mirror? There can be no permanent record of Nature but by some method of approximation—by artificial means.

Color cannot be got by any method inherent in photography itself. We might possibly some day discover a means of transmission of the actual in Nature, so as to molecularly impress it in all its beauty; but the question is, could such a rendering be made permanent as a photograph?

When ordinary light is analyzed by the spectroscope, it is found to consist of a mixture of different kinds of light, which, falling upon the retina, produce various vibratory sensations, giving rise to what we call color perception.

Even the physiological explanation of this wonderful phenomenon is not entirely satisfactory, despite the labors of Helmholtz and others. The notion about the cones and columns in the retinal structure is mere guesswork, never experimentally proved. There seems some truth, however, about the change in visual purple substances, which reminds us of photogenic action like our processes in photography. The eye may make a color photograph for the mind, but it has no means to fix it, or, fortunately, it finds it would not do to fix it.

Further, we know that if an object does not equally reflect all different kinds of light of which the white light is composed, the reflected light, falling upon the retina, will be more or less wanting in some of the constituents which produce the sensation of color; so that a colored object is one which does not equally reflect all the elements of white light, but absorbs some. The light absorbed, we are told, is converted into heat. Now, how can we expect any artificial, sensitive surface to possess structural or molecular quality to discriminate in appropriation of the various colors just where they are needed?

We must premise a body having selective ability in entirety with molecular structure of every variety. If we analyze the light reflected by any colored object or transmitted by a colored screen, we shall find that the continuous spectrum which is obtained with white light is replaced by one from which a portion is partly or completely missing. This missing portion appears as a black band, known as an absorption band, of that color. If a particular object absorbs most of the elemental colors, so that only a small portion of the spectrum is reflected, that portion may be referred to as the reflection or transmission band.

Since the light which is not absorbed falls upon the eye, the sensation of color produced is the reverse or complementary to the color which is absorbed. When white light is spectroscopically examined, there is shown a band of colors consisting of three main portions—red, green and blue-violet, the red passing into the green through gradations of orange and yellow, and the green into violet through gradations of blue-green and blue. So sensations of various colors are the result of certain mixtures.

But perhaps we have said enough to show what the experimenter after direct color reproduction is up against, and, considering the complexity of the problem, we may reasonably conclude that much more patient investigation is demanded in physics and chemistry before we may hope to be able to get a film which shall perform the function of the eye, and, besides, a plan for arresting the action at any desired moment.

Garden Photography by the Screen-Plate Process

If there is one branch of photography more than another in which the screen-plate color processes may be employed with advantage it is in the portrayal of garden scenes. This is a possibly remunerative field for the progressive professional photographer. Color is the very essence of the delight of the garden, and without it, no matter how highly technical the skill of the photographer, even the best that a

monochrom photograph can attain to will fail to satisfy the ideals of the owner or designer of a beautiful flower garden. This is the crux of the whole matter. The garden lover wants photographs as records of what he has accomplished and which will last long after the glory of the original has departed. The field is a wide one for professional work. Certain seedsmen have adopted the idea, presumably using the three-color process, though so far the results, from the point of view of truth and general photographic quality, leave much to be desired, particularly in the case of garden scenes, which are to a marked degree inferior to studies of individual flowers, though, of course, something may have been lost of the beauties of the original picture in the production.

In order to be successful, the photographer must keep in mind the requirements of the owner of the garden, even if this entails the sacrifice of his own pictorial ideals to some degree. The forms and characteristics of the occupants of the herbaceous border correctly rendered will certainly be far more pleasing to the customer than a mere artistic rendering of masses of color. The foundation of success in faithful color rendering lies in the greatest exactitude in exposure. If the subject is an important one, and the owner of the garden is prepared to go to the extra expense, it is a good plan to make a test exposure, as follows:—The meter test of the light is carefully taken, and the exposure worked out, we will assume, at 1 second. A color plate is exposed in steps of say, ½, ¾, 1, 1½ seconds respectively, pushing the shutter of the slide in after each one, in the same way that an exposure test is made when enlarging upon bromide paper. The plate is developed and quickly finished. Upon examination, the worker will be able to judge of the length of exposure to give to ensure the most satisfactory result. This is an essential experiment for any color photographer who is wishing to get the finest possible results. The experiments suggested above will ensure much more faithful color translations.

In regard to the choice of subject, the photographer is, as a general rule, in the hands of others, although he can do a good deal as regards choice of view point and lighting to bring about the most satisfactory results. He will do well to avoid, as far as possible, stunt lightings and freak effects. Figures may often be employed in assisting the composition of garden pictures in colors, especially feminine ones wearing bright or distinctive clothing. They may be suitably posed, strolling along walks or in the rose garden, and, if kept properly subordinate to the rest of the composition, have a decidedly helpful effect.

The choice of lighting should also receive careful consideration. Bright sunshine is almost essential in order to ensure that the colors are fully emphasized on the plate. The sun should not be directly overhead, the best results being generally obtained when the sun is low, early morning or late evening, in my experience, being productive of the best results. I need hardly say that there should be no wind, for nothing detracts so much from the beauty of an otherwise good color transparency than blurred images, due to movement. If the work must be done during windy weather—and the fleeting nature of some of the subjects often demands that it is a case of "now or never"—still moments should be carefully watched for and the shutter closed directly movement begins.

In regard to equipment, little need be said. One point, however, may be mentioned. It is customary in this class of work to recommend a lens of fairly long focus. Whatever may be the advantages in this connection, there are certain disadvantages, and my own preference is for an instrument of fairly short focus, for the simple reason that depth of field may be obtained without too much stopping down. Even under the most favorable conditions the exposures are long enough, and a lens that will give a sharp image over many planes at an aperture of not less than f68 is a decided advantage.—ROBERT M. FANSTONE in *The British Journal of Photography.*

Abridged Scientific Publications from the Research Laboratory of the Eastman Kodak Company

The IV volume of this valuable publication contains thirty-five papers in an abridged form by eminent investigators in photographic fields, for the convenience of readers for consultation. Those who are particularly interested in any special paper are advised to consult original sources for more complete data. The papers of which abridgments are here issued were published in full during the years 1919-1920. These abridged bulletins of all scientific papers of the Research Laboratory of the Kodak Company are issued periodically.

Drops in the Formula

We recently picked up a formula in which the photographer gave the quantities of liquids indiscriminately as drops and minims, in the belief, no doubt, that it makes no difference and relieves, at the same time, of the fault of tautology.

It may be true, in a good many cases, that it is of no vital consideration whether we measure indiscriminately by drops or minims, but where accuracy is demanded it must "give us pause." Not only do drops of the same liquid vary in size, according to the form of the mouth of the vessel from which they are dropped, but almost every liquid has a specific size of its own.

Thus, nitric acid falls readily in very small drops, while some other acids make spherules of considerably greater magnitude. The ambiguity is further increased when the experimenter endeavors to convey his information without designating what kind of a vessel he is using.

A minim, we need hardly tell you, is really something quite different from a drop. Indeed, a drop may sometimes be only half a minim, or it may be one and a half; aqueous solutions are generally larger than alcoholic solutions in drops. The conditions, therefore, governing the size of drops are not confined merely to the physical characteristics of the fluid under consideration, but also to the rapidity of delivery, the size and shape of the bottle's neck, and the extent to which the rim is moistened.

Here is a table showing the number of "drops" of different liquids equal to one fluid dram.

Acetic acid	120	to	dram
Hydrocyanic acid	45	"	"
Hydrochloric acid	54	"	"
Nitric acid	84	"	"
Sulphuric acid	90	"	"
Alcohol (95 degrees)	138	"	"
Alcohol (75 degrees)	120	"	"
Ether	150	"	"
Water	50	"	"
Ammonia	45	"	"

This table shows the impossibility of any approach to accuracy in the employment of drops as a means of measuring liquids.

There are laboratory devices for the delivery of drops in an accurate, definite way, and any intelligent photographer should make use of the pipette and the burette. The portion desired may be made to ascend the tube, and by an easy device to discharge it just when desired.

Pittsburgh Salon

Entry forms are now ready for the Annual Pittsburgh Salon of Photography, held under the auspices of the Photographic Section of the Academy of Science and Art, in the galleries of the Carnegie Institute, Pittsburgh, Pa., from March 2d to March 31st, 1923. Last day for receiving prints is February 5th, 1923. Blanks and further particulars may be obtained from Charles K. Archer, Secretary, 1412 Carnegie Building, Pittsburgh, Pa.

The following have been elected "Contributing Members": Elizabeth R. Allen, Moorestown, N. J.; Henry A. Hussey, Berkeley, Cal.; W. C. and T. M. Jarrett, Pittsburgh, Pa.; Myres R. Jones, Brooklyn, N. Y.; Sophie L. Lauffer, Brooklyn, N. Y.; W. W. Zieg, Pittsburgh, Pa.

Sincerely yours,

CHARLES K. ARCHER,
Secretary.

Analysis of the Royal Photographic Society's Exhibition

The catalogue of this year's exhibition of the Royal Photographic Society, just received, shows that only 154 prints were accepted in the pictorial section, and that the balance of the space was assigned to the technical and scientific display. Of these 154 examples only 24 were the work of Americans, divided among 12 exhibitors, a few of whom were well-known and representative, others not so and some heretofore unknown.

While the entries this year were probably as numerous as previously, and included a number of our foremost pictorialists and their excellent work (some of which we have published), their offerings were rejected.

All this was possible owing to the lack of adequate facilities. The fact is, 154 prints do not nearly represent the amount of splendid British examples probably submitted, to say nothing of American and other entries. Therefore, with the technical and scientific section, the Royal, in its present quarters, is not a suitable place for the display of much work from this country; and, in all probability, American workers will do in the future as was done formerly—send their pictorial entries to the London Salon and their technical and scientific offerings to the Royal, as long as space can be found for acceptance.

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SPIRITS AND FAIRIES IN THE CAMERA

MANY years ago trick photographs in great numbers were produced by amateurs and even by professionals, generally with acknowledgment of the fraud, but now and then in pretense. In the days of the wet plate such tricks were not very difficult. Glass was used a number of times, and if the cleaning was not thorough, some of the previous impression would appear in the picture, although inspection might not show any remains of the film carrying the emulsion. In this way, the writer of this article had a trace of a whitewashed board fence appear in a portrait negative. Had the condition been reversed, that is, had a faint indication of the portrait appeared in the view of the back yard, the plate would have been valuable as a "spirit" picture, but even the vivid imaginations and trusting faith of Sir A. Conan Doyle and Sir Oliver Lodge cannot stretch so far as to believe that a pine board can have a sub-liminal self.

Interest in spirit pictures and similar matters has been actively revived of late by the publication of Conan Doyle's "The Coming of the Fairies." This relates to the experiences of two girls, who, in 1917 when the pictures were taken, were respectively sixteen and ten years old. They are cousins, and live in a small hamlet in Yorkshire. The pictures were taken with a small plate camera, belonging to the father of the older girl. It is stated on good authority that neither of them was familiar with use of a camera, but that the older girl, who took a picture showing several fairies (conventional) dancing before her cousin, had succeeded in the first attempt at photographing the fairies which both of them had often seen. Later, Frances, the younger girl, took a photograph of the older (Elsie) with a gnome (also of the conventional form) standing in front of her. A number of other pictures are given, but most of them are either portraits of persons connected with the stories, or of the places at

which the manifestations occurred. It appears that the pictures were kept three years before being brought to the notice of any person of scientific or official position. Doyle heard of them and, naturally, was much interested. He did not visit the place or interview any of the parties, but derives his knowledge through a man active in theosophic propaganda.

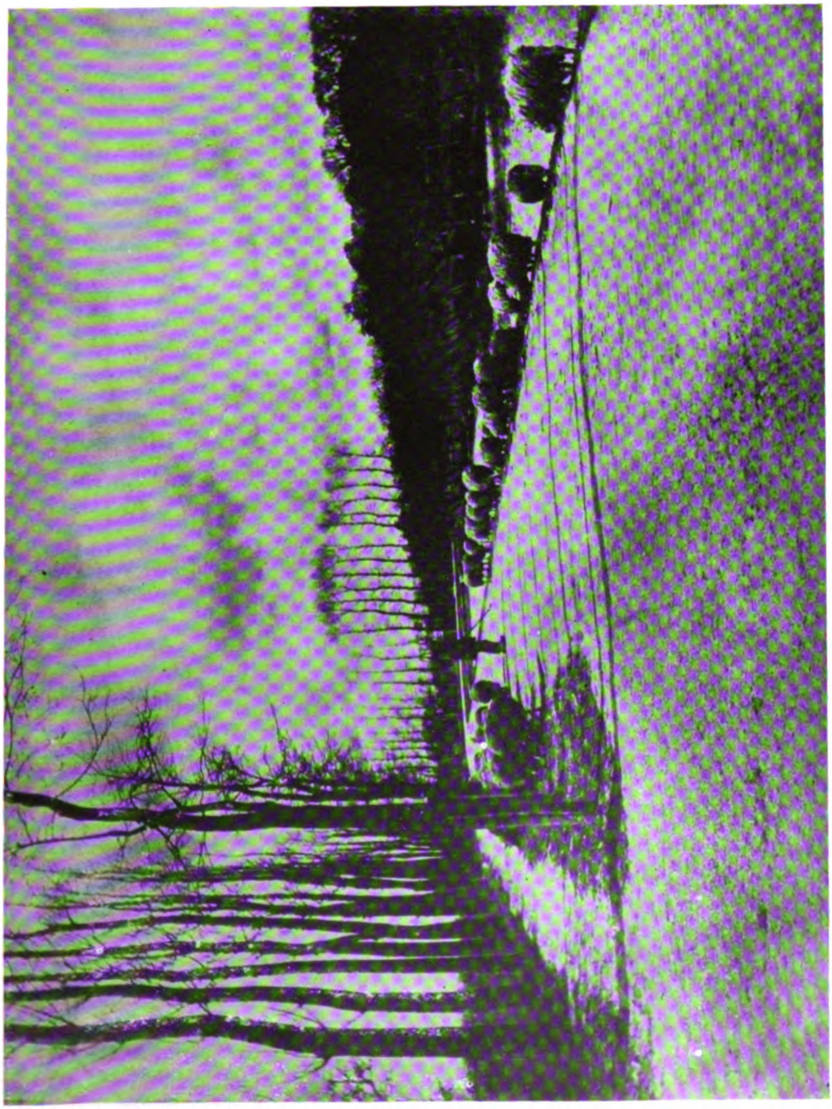
Comparatively few independent examinations of the matter are noted in the book. The representative of a prominent London magazine visited the locality and interviewed many persons. He found out that no one but the two girls had ever seen the apparitions, and that they had not been accompanied by any third person at any time that the appearances occurred. In the photograph showing the older girl with the gnome, the girl's right hand is very large and somewhat deformed. In none of the other photographs, in which this girl is shown, is her hand distinctly indicated and in most it is invisible. It would be interesting to know whether her hand is abnormal, large and deformed, the details of the deformity and its history.

As for the supernatural figures they are the strictly conventional ones. The gnome is a dwarfish figure with a projecting abdomen, skinny legs, beard and pointed cap; the fairies are just like those that used to hang in arsenic green on wires in the transformation scene in the pantomime. Their wings are essentially those of butterflies. They have gossamer clothes with considerable display of limbs, and one of them seems to be playing on a pipe.

The "spirit pictures" of older date were usually merely a shadowy impression of a face alongside the distinct features of some one else. The effect could be obtained by a very slight exposure for the first and full exposure for the second. The trick was performed often by taking, with very short exposure, a copy of a picture of a deceased member of a family and using the same plate to make a portrait of a relative or friend of the same; when, upon development, the shadowy face of the departed would appear. Many other trick pictures were devised, but only rarely was an attempt made to palm these off as genuine, and when such was done, the fraud was quickly exposed.

The situation with regard to the pictures in Doyle's book is entirely different from the old one. Doyle insists that the pictures are genuine, that the two girls who get them are entirely unaware of the methods of making fake pictures, that when Frances was taken with the dancing fairies by Elsie, the latter had never before used or handled a camera, and that the plate had been pronounced by an experienced photographer to be the result of a single exposure. The name of this person is given; he does not seem to be widely known to photographic fame, notwithstanding which he may be a very good judge in the matter. The experts of two prominent British firms refuse to give an opinion, though some stated that the conditions shown on the plates could easily be imitated.

The most remarkable point about all the series is that the beings shown are the ordinary conventional forms. There is no evidence that any one has previously seen a fairy, gnome, or any other of the little creatures with which peasant superstition has, for so many centuries, peopled the forest and dale. It will be worth while for some one to make search in the records of pictorial



"A UTRECH PASTORAL" J. CRAIG ANNAN
SCOTLAND

From United States National Museum collection at The Camera Club, New York.

"LA MALADE IMAGINAIRE" © RICHARD POLAK
HOLLAND

From United States National Museum collection at The Camera Club, New York.

art to discover, if possible, the original suggestions of the forms of these super-human beings. It is an essential and inherent characteristic of the human mind that it cannot formulate anything outside of its experience, hence all suggestions of super-human beings are merely fantastic and grotesque modifications of the living organisms that we see around us. The ideas of the older artists as to fairies, pixies, gnomes, ghosts, goblins and all similar forms are as purely imaginary as the comic artist's idea of microbe, which is often represented as a distorted, more or less human shape, with filamentous arms and legs.

One of Doyle's pictures termed the "Fairies' Sun-bath" shows a somewhat confused collection of plants, in the center of which is a vague bag-like object, which has an approach to the appearance of a human being in a loose robe, taken somewhat out of focus. To one side is seen, not very markedly, but still visible without much difficulty, a fairy in profile. We are told that the central object is a "magnetic bath" that the fairies make for their use. It is due to Doyle to say that he has not seen the persons who send these photographs, and that in his book he simply lays before the reader the reports he has received from others, although he argues earnestly for the trustworthiness of their statements, and seems to believe them implicitly. He points out, moreover, that he is not directly interested in the field exploited in the volume. He is preaching the doctrine of the resurrection of human beings in such form that communication between them is possible and does frequently occur. The world of super-human beings from cherub to goblin is really not being explored by him.

It has been mentioned that the experts of two British firms refused to give opinions on the negatives, but said that it would not be difficult, with certain "stage properties," to obtain similar results. It is to be regretted that something was not done along this line, for the subject is of great public interest. Comparatively few people know the possibilities of photography, especially in its highly developed modern forms. It is true that the motion picture has been developed along a somewhat similar line, especially by the employment of double printing, so that the same person may be figured twice in the same scene. In this way, an actor may take the parts of both Sydney Carton and Charles Darnay in scenes in which both are present; but the onlookers may not be aware of the method.

A scientific criticism of moment was given by an expert British photographer, to the effect that the dancing fairies are shown in "picture motion" and not in "photographic motion." It is now well-known that the conventional methods by which artists represent moving animals, especially those in moderately rapid motion, such as walking, running or dancing, are not correct for any given moment of action, but that when a quick picture is taken, an awkward pose is almost always shown. The artist's picture is a composite of the several succeeding movements that are completely fused in ordinary vision. Now the British expert points out that the dancing fairies are shown as an artist draws them and not as they would be caught by the camera on an exposure of one-fiftieth of a second, which is that claimed for the picture reproduced in Doyle's book.

A SIMPLE PROCESS FOR COLOR PHOTOGRAPHY

IN A RECENT number of *Il Corriere Fotografico,* Ernesto Baum writes concerning a process of color photography which has been forgotten, but which he thinks worthy of attention, especially by amateurs, who generally consider as burdensome the usual three-color methods with superposition. The procedure, which is termed "Dichromic," is not applicable to all subjects. It was invented by Gurtner, of Berne, and patented some time ago and is very simple, requiring no color screens, no artificial coloration and no complicated apparatus. A single exposure in an ordinary camera suffices. Two negatives, one blue and one yellow, are produced simultaneously, but no red one. Notwithstanding this lack, many subjects may be found to which the process is applicable.

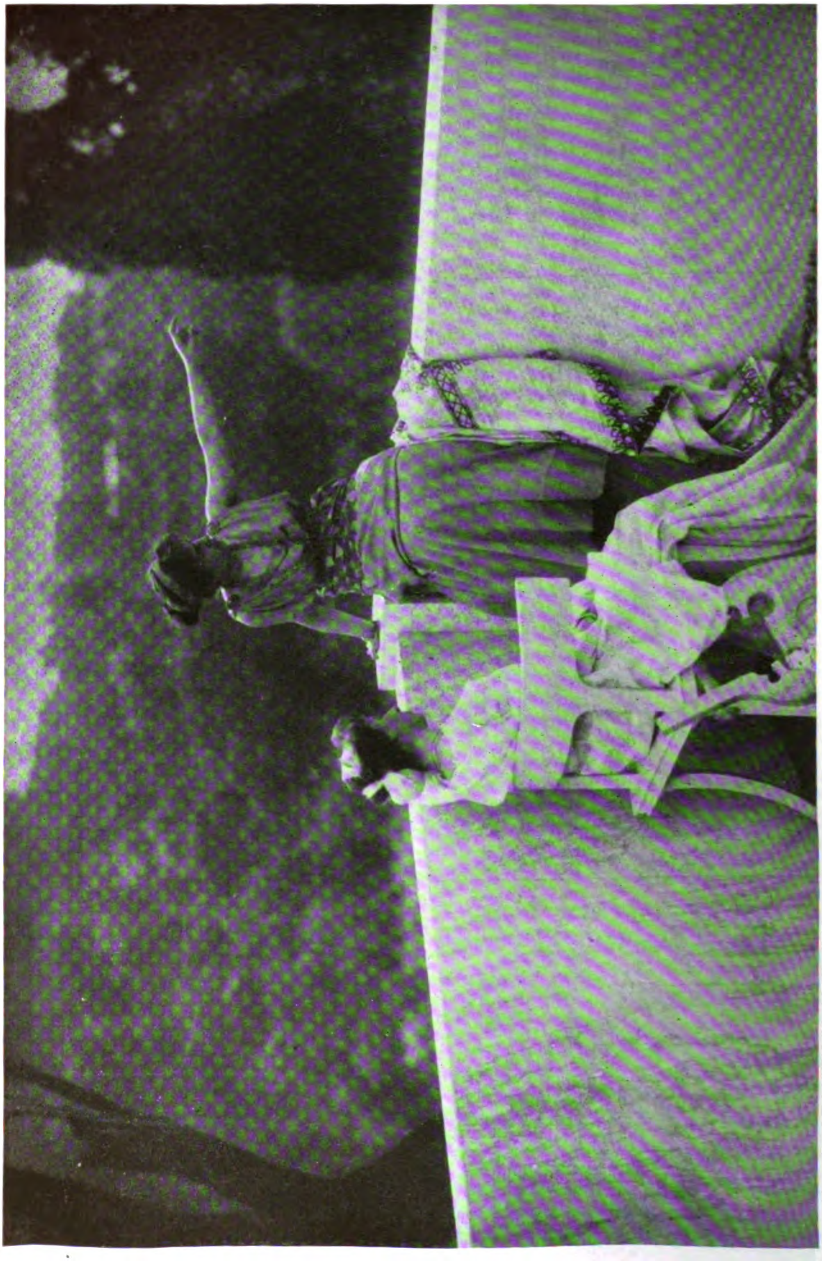
A plate suitable for transparencies (chlorobromide emulsion) is orthochromatized for blue by immersion in a bath of naphthol yellow. The amount of color to be used will depend on the make of the plate. The solution is made by dissolving, as stock, one part of the color in 200 parts of water and of these 5 parts are added to 100 parts of distilled water for use. The plate is bathed in this for two minutes and dried in a well-ventilated place, these operations being, of course, conducted in darkness. The plate should have distinctly the color of the dye and not be rendered more opaque by it. This plate is put in contact with a panchromatic plate, the coated surfaces touching, and the combination inserted in the plate-holder in such a manner that the uncoated side of the plate, which has been bathed in the naphthol yellow, is towards the lens It is, of course, necessary that in arranging for this work, the plate-holder should be examined to see if the two plates can be satisfactorily inserted in it. To secure a better focus, it is a good plan to reverse the ground-glass, as is sometimes done with autochromes.

In the exposure, the yellow dyed plate serves to record the impression of blue and also acts as filter for the panchromatic plate, which receives only the yellow and green rays. Of course, the red rays also pass through the first plate, but the subject should be chosen so as not to afford appreciable amounts of these. The interposition of the dyed plate will involve an increase in exposure time, and it is not satisfactory to use very brief exposure, except when a very strong light is available.

Amidol is recommended for the development of the negatives, inasmuch as it gives delicate and well proportioned results, which are necessary for success in this method. The plates are fixed in acid hypo as usual, but in warm weather should be hardened by a bath of sodium acetate and chrome alum. The following proportions are recommended, and will be found useful for all fixing in the warmer season. To the usual 25 per cent. hypo solution are added 2.5 parts of weight of sodium acetate for each hundred parts of solid hypo, and the addition of 2 per cent. of chrome alum. After the plates are duly washed

"AU PASSAGE D'EAU" LEONARD MISONNE, BELGIUM

From United States National Museum collection at The Camera Club, New York.



"THE RACONTEUR" GUIDO REY, ITALY

From United States National Museum collection at The Camera Club, New York.

and dried, the making of the positive may proceed. The plate dyed with naphthol yellow is used to print on a chlorobromide plate, or on paper that is given a blue tint by any of the common methods. The old procedure of Vogel may be here used in which two solutions are employed, one of ammonio-ferric citrate and the other of potassium ferricyanide (red ferricyanide) both of 1 per cent. The first solution is mixed with dilute acetic acid and to a suitable volume of it is added an equal volume of the other solution. The impression is cleaned in the bath, and if the whites are somewhat yellow, a preliminary treatment with a 2 per cent. oxalic solution will remedy this.

The panchromatic plate, which in this operation serves to record the yellowish green rays, is used to print on a detachable emulsion, and the result fixed in plain hypo, without toning. There is obtained a gradated yellowish-red that is ready for making a number of copies. A simple superposition of the two copies will give the color picture in character very close to the original view, if this has been chosen so as to suit the limitations of the process.

Films suitable for detaching not being always at hand and besides such detaching being not always easy, Baum recommends the use of the paper negatives with detachable films, but in such case it will be necessary to tint the film, as otherwise the fixing bath will make the silver image black. The latter suggestion is, however, of no value to American workers, as the paper negatives of German manufacture are not easily obtainable.

"GRACE BEFORE MEAT" ALEXANDER KEIGHLEY, F.R.P.S. ENGLAND

From United States National Museum collection at The Camera Club, New York.

PHOTOMICROGRAPHY APPLIED IN FOREST PRODUCTS RESEARCH*

ELOISE GERRY, PH.D. AND MELVIN E. DIEMER, PH.D.
MICROSCOPIST CHEMIST AND PHOTOGRAPHER

PART I. APPLICATION OF PHOTOMICROGRAPHY

PHOTOMICROGRAPHY is applied in many and varied ways in the different investigations underway at Madison. Photomicrographs are used as a means of record. They also serve for making special comparisons, and demonstrating differences and similarities to interested observers, since they are easy to carry about and may be used where microscopes are not so readily available, or where the material compared can be preserved for only a limited time. Their application in educational work, both teaching and publication, is unlimited.

A few of the more important special applications of photomicrography to research in forest products follow:

Photographs showing the minute structure of wood serve to make clear fundamental differences, as in the case of figure 1, where cross sections are shown, at the same magnification, of one year's growth of four woods. The first three are representative of the main types of commercial woods. One other type, the palm, shown next, concludes the list. Every wood resembles one of these four types.

In a similar way the structural features which distinguish the *species* of wood within any one group may be demonstrated, as in figure 2, where all of the red oaks are positively distinguished from all of the white oaks by the fact that the small pores of the summer or dense wood of red oaks are larger than the corresponding small pores of white oaks.

Again if a person, who wishes to purchase mahogany furniture, possesses the information on wood structure illustrated in figure 3, he will be able to recognize the differences between true mahogany, and birch and gum which are often stained to resemble mahogany. The pores of the mahogany are much larger than those of the other two species. In mahogany these pores are *readily seen with the naked eye*, not only as roundish holes on the end grain like those in the figure, but also as fine grooves, somewhat dark in color, on the ordinary exposed surfaces of the furniture. In birches these grooves are smaller, *barely visible to the naked eye*, and in red gum they usually *cannot be seen* without a magnifying glass.

The identification of wood pulps is accomplished in the same way as the identification of wood; that is, by the aid of a knowledge of the characteristic structure of the elements of wood. The identification of a wood by the length

*Contribution from the Forest Products Laboratory, Forest Service, United States Department of Agriculture, Madison, Wisconsin. Prepared for the September 14, 1922, meeting of the Technical Photographic and Microscopical Society at the Grand Central Palace, New York City. (Illustrated with lantern slides and eight wall panels, including some 40 photomicrographs here attached.)

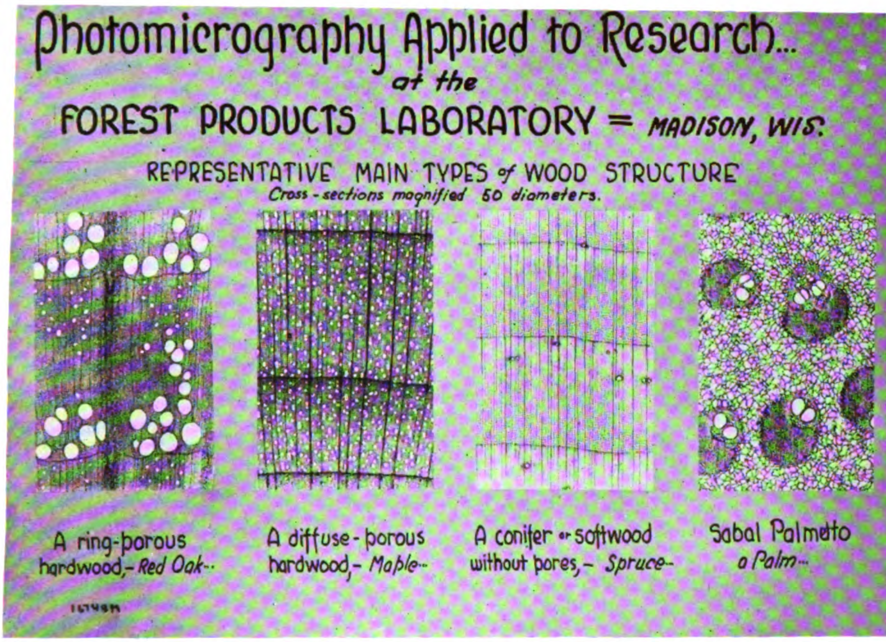

Photomicrography Applied to Research...
at the
FOREST PRODUCTS LABORATORY = MADISON, WIS.
REPRESENTATIVE MAIN TYPES of WOOD STRUCTURE
Cross-sections magnified 50 diameters.
A ring-porous hardwood,- Red Oak..
A diffuse-porous hardwood,- Maple..
A conifer or softwood without pores,- Spruce-
Sabal Palmetto a Palm...

FIG. 1

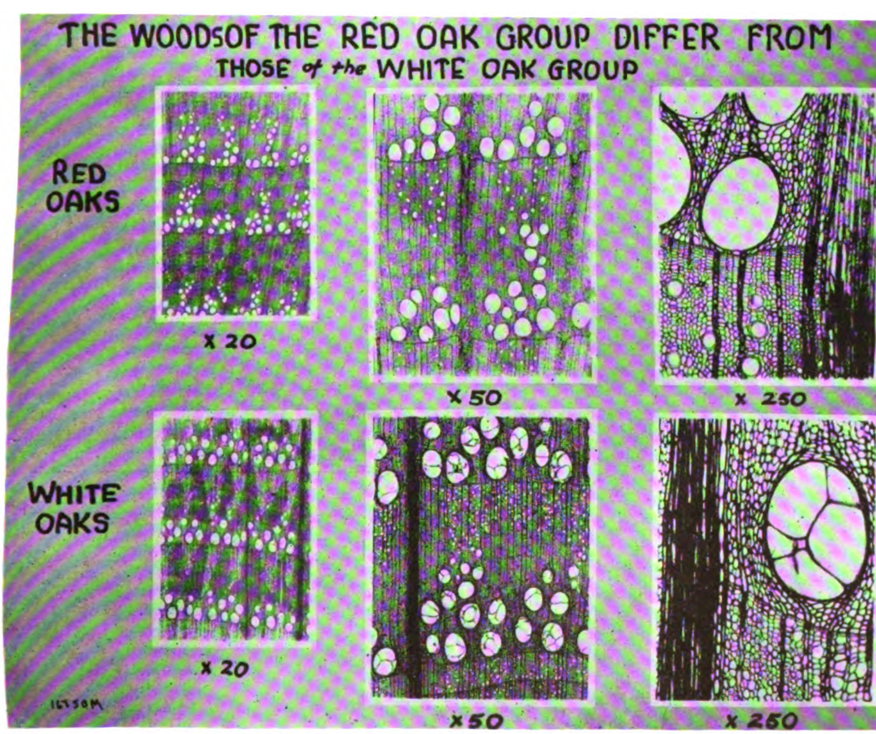

THE WOODS OF THE RED OAK GROUP DIFFER FROM THOSE of the WHITE OAK GROUP
RED OAKS
WHITE OAKS
x 20
x 50
x 250
x 20
x 50
x 250

FIG. 2

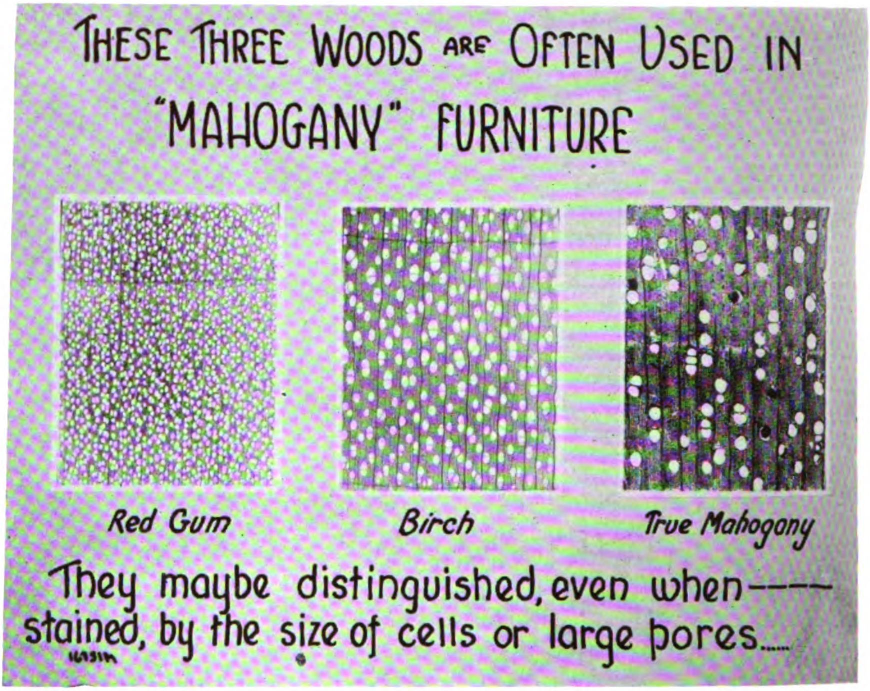


FIG. 3

of its fiber is rarely safe, since great variations exist in one tree and even in one annual ring, (figure 4).

The ends of the *vessel segments* which remain more or less well preserved, even in chemical pulps, have characteristic shapes and markings, as shown in figure 4.

The characteristic cells of the *rays* also are often well preserved in ground wood pulps and persist to a less extent in chemical pulps. Figure 4 shows some characteristic features of ray structure.

Significant differences found in pulpstones for making groundwood stock may be photographed (figure 5). The coarseness of the stone bears a relation to the characteristics of the pulps produced.*

The effect upon the condition of the fiber produced by the *beating* of a pulp may be clearly demonstrated by photographing slides prepared from material taken after varied length of beating, and the same method may be applied to pulps which have been *cooked* for varying periods.** (Figure 5.)

Decay and molds seriously affect wood and pulps and they are often nearly invisible, but destructive attack may be clearly shown in photomicrographs. Figure 6 illustrates a piece of apparently sound Sitka spruce which was seriously infected with fungi. A remarkable differential staining of the various features

*See United States Department of Agriculture Bulletin 343, "Groundwood Pulp," by J. H. Thickens and G. C. McNaughton.

**United States Department of Agriculture Bulletin 80, "Effects of Varying Certain Cooking Conditions in Producing Soda Pulp from Aspen," by H. E. Surface.

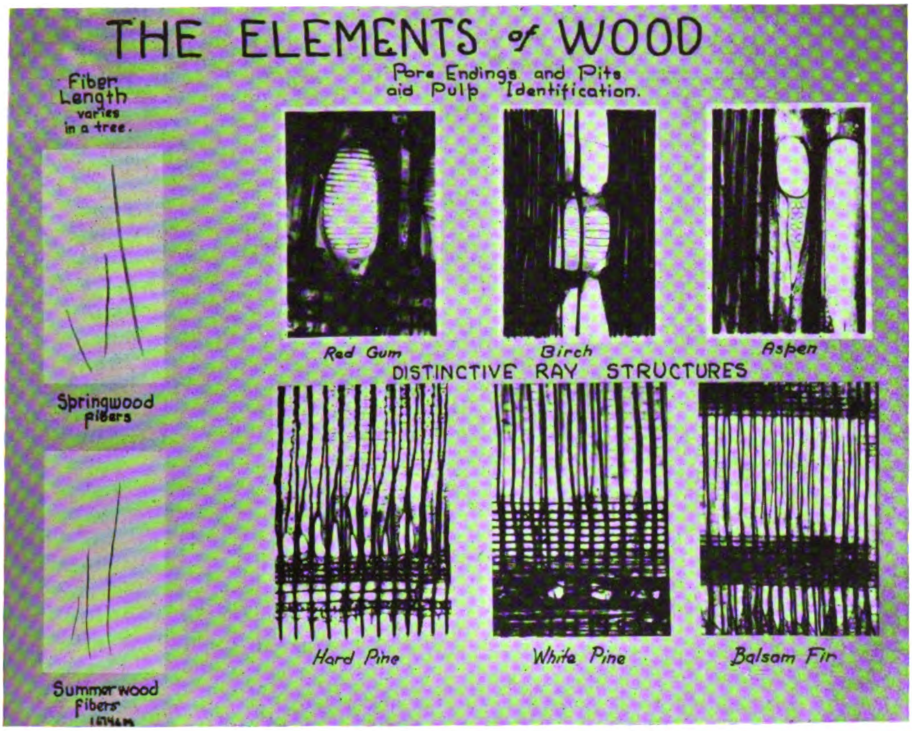


FIG. 4

of the wood structure, as well as the fungus mycelium, was obtained in this case by the authors, through the use of gold chloride.† The mycelium and the wood were both equally colorless before staining. When the gold solution was applied, however, the main part of the wood became a light red, the mycelium a deep bluish purple, and the ray cells according to their condition red or blue. The so-called bars or rims of Sanio also stained a dark color.

The appearance of the early stages of a serious decay is also shown in figure 6. The holes, where the fungus has completely destroyed the cell wall, greatly reducing the strength of the wood, are clearly shown.

Molds and decays are a serious matter in the manufacture and storage of groundwood pulps. In this connection, special studies have recently been carried on by the Laboratory, the Office of Forest Pathology of the Bureau of Plant Industry and the industries interested. The photomicrographs of fibers (shown in figure 6) were prepared in connection with these studies.§ They show how markedly the length of the fiber is reduced as the result of the fungous infection (average length of the clean groundwood 1.09 mm. as compared with that of the infected pulp 0.25 mm.).

The United States leads the world in the production of turpentine and

†"Stains for the Mycelium of Molds and Other Fungi," by M. E. Diemer and Eloise Gerry. Science LIV, Dec. 23, 1922, p. 629.

§"Some Observations on the Deterioration of Wood and Wood Pulp," by O H. Kress, C. J. Humphrey and C. Audrey Richards, in *The Paper Industry*, Oct., 1919.

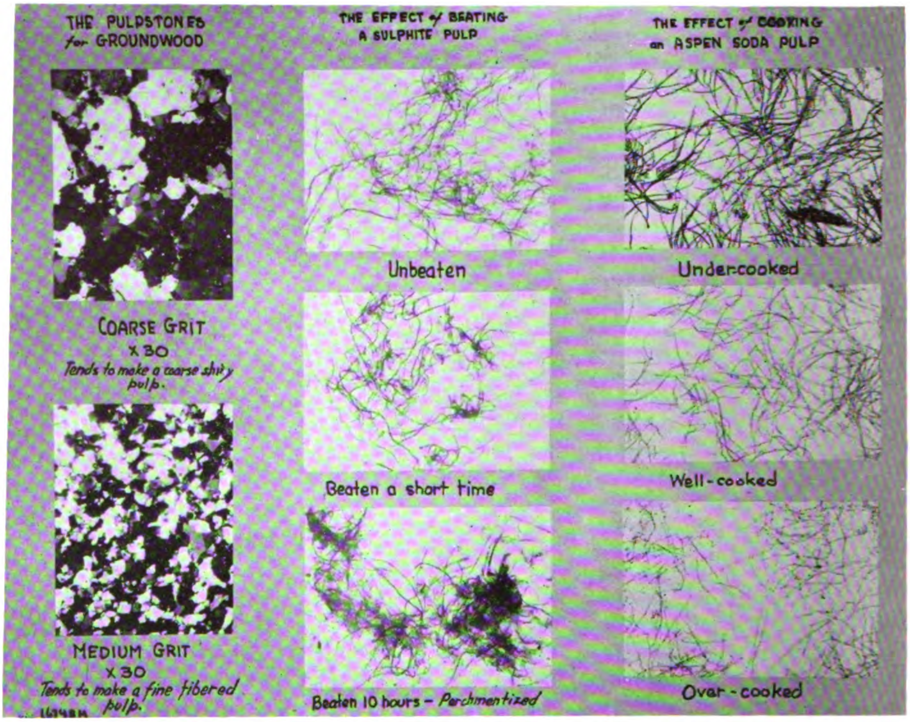


FIG. 5

rosin (naval stores). These now come from the remarkably productive long-needled pines of the southeast. Methods in the past have been ruinously wasteful. The results of experiments initiated by Dr. Charles H. Herty, and additional ones carried on later by various other members of the Forest Service, have assisted in slowly bettering methods. The use of photomicrography, to demonstrate the results obtained by microscopic investigations of the effect of the methods used in turpentining, has been of great service. The increased formation of productive resiniferous tissue is shown in figure 7. Too severe chipping not only reduces wood formation, but does not obtain as high a yield of gum as conservative chipping, which maintains the vitality and productive power of the tree.

Native storax, which serves the same purposes as the imported oriental storax for the manufacture of pharmaceuticals, perfumes and tobacco and as a source of cinnamic acid and cinnamyl alcohol, may be obtained from our native red gum or star-leaved gum, *Liquidambar styraciflua*. The ducts which yield this storax are not present in the normal wood, they are produced only as a result of wounding. The photomicrographs in figure 7 show the distribution and character of these ducts. A higher yield was obtained by making nearly horizontal wounds than by making vertical ones ||

|| "The Production of American Storax," by S. A. Mahood and Eloise Gerry, *The Druggists' Circular*, Jan., 1921.

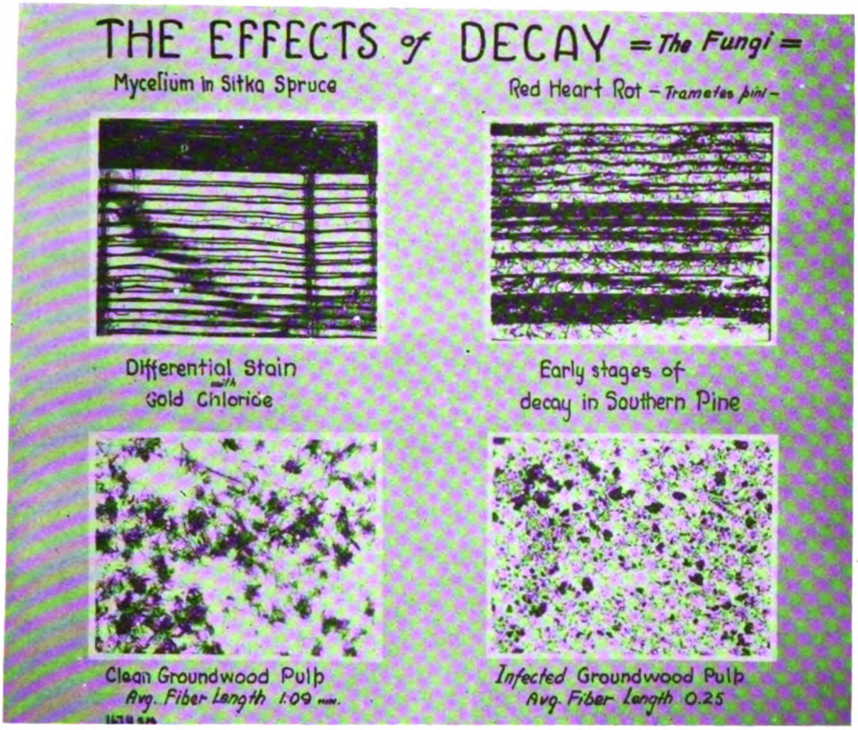


FIG. 6

Woods vary greatly in the ease and extent to which they may be penetrated by liquids (see figure 8). Minute carbon particles in a water suspension, for example, could not be forced through Douglas fir, even under high pressure.

Tyloses, thin balloon-like structures, which fill the older pores of some woods, such as white oak, markedly affect permeability.

The structure of the wood also has a marked effect upon the ease with which it may be glued. The glue readily penetrates only the larger openings of the wood which are exposed at the surface. It rarely penetrates the cell wall.

The mechanical or strength properties of wood are indicated to a considerable extent by its structure. This relationship is shown in figure 8. Longleaf yellow pine (clear) which has a very dense summer wood has, for instance, a bending strength of about 87,000 pounds per square inch. The bending strength of comparable white pine, on the other hand, which has fewer thick-walled summer wood cells, is much less, *i.e.*, 53,000 pounds per square inch.

PART II. METHODS OF PREPARING SPECIMENS AND PHOTOMICROGRAPHS

In order to obtain photomicrographs, such as the ones shown, it is necessary to have thin sections of wood, 1/5000 inch (5 mu) to 1/800 inch or so in thickness. These are cut on a sliding microtome of very rigid construction, equipped with a specially hardened steel razor. The sections are variously

stained and usually permanently mounted in Canada balsam. Such sections are dried in warm air, under weights, to obtain as flat a surface as possible.

A combination of Haidenhain's method of using ammonia-iron alum and hematoxylin with a water-alcohol safranin, as described by Prof. E. C. Jeffrey in "The Anatomy of Woody Plants," is one of the most satisfactory stains used.

Pulp specimens are mounted in a similar way, but very satisfactory photomicrographs are often obtained from temporary mounts of fibers in glycerin and alcohol.

In preparing and identifying specimens and analyzing pulps, a comparison ocular has been found a very desirable piece of laboratory equipment. By using two microscopes, with the specimens to be compared on their respective stages, a direct comparison can be made and areas to be photographed marked so that they may be located readily.

Photomicrography of material, such as wood sections, pulps and fungi, that is, specimens from the sciences of biology, anatomy, pathology and bacteriology, is quite different from that of specimens from petrography, mineralogy and metallurgy. The former class, as a rule, requires the use of one or more stains in the microscopic preparations and consequently gives rise to problems of photographic color separation and contrasts not ordinarily encountered in the latter.

The equipment used for making such photomicrographs consists primarily of a rigid microscope and camera stand with lamp, lamp house and condensing system, preferably on the same mount. Such an apparatus eliminates, to a large extent, vibrations between its different parts, and facilitates rapid and accurate mechanical and optical adjustments. The principal elements constituting such an apparatus are illuminant (arc or incandescent lamp), lamp housing, substage condensing system, microscope, camera bellows and focusing plane, all of which must be in their proper relative adjustment to secure sharp, well-defined photographs. The illuminant, whether incandescent or arc lamp, is intense, especially for making the higher power photographs, not alone because of the ease of finding and focusing, but also on account of the resultant shorter exposures which minimize vibration trouble and focal changes in the microscope due to mechanical strains and heat conduction.

The microscope used is of the large barrel type, provided with micrometer focusing adjustment, revolving and mechanical stage. The camera bellows and mounts used are from two to five feet in length, if large photographs are to be made, and are provided with an easily manipulated focusing screen (ground-glass) and plate holder adapter. For low power photomicrographs (75 diameters and less) an objective only is used, and that preferably of the anastigmatic type such as the Bausch and Lomb micro-tessars. No attempt is made to photograph to the full area of their light circle, rather a long focus lens and long bellows draw is used. For higher power work (75 to 2000 diameters) the ocular is used in connection with the objective. Here again, amplification is gained by bellows length rather than by the high power ocular. This allows one to work well within the light circle, thus covering the larger plates (8 x 10) to their extreme margins

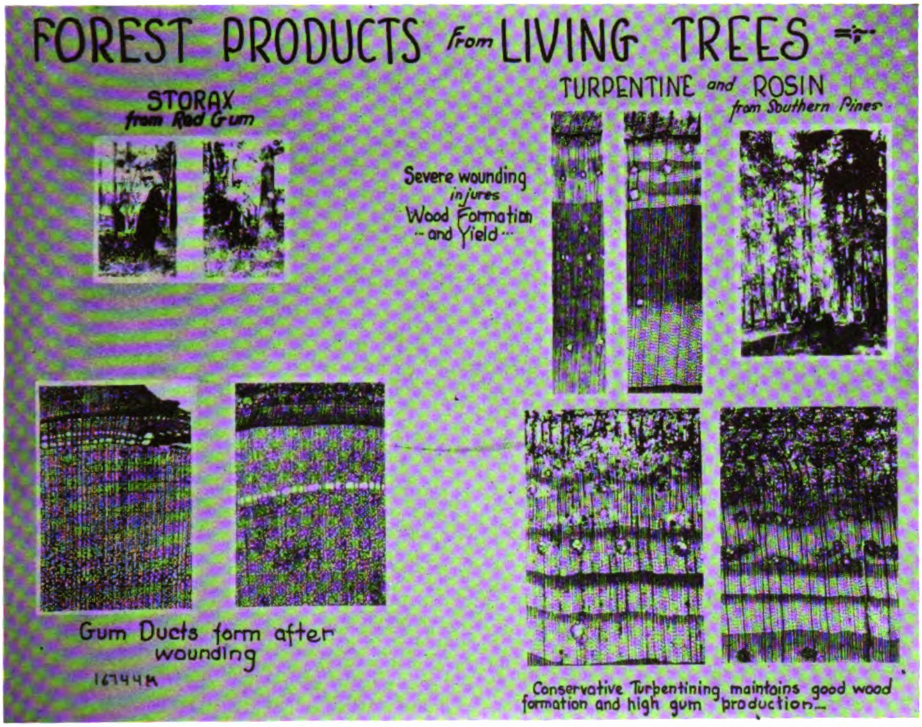


FIG. 7

If an arc lamp is used as illuminant, the sub-stage system includes a cell for very dilute bichromate solution. This, while it does not interfere with the use of supplementary light filters, eliminates the shorter wave lengths to which lenses are not corrected and to which plates are super-sensitive.

In photomicrographing wood structure and pulp samples, two systems of sub-stage illumination are practicable. For low power work, using intense illumination, parallel light may be thrown to the microscope sub-stage, while for the higher powers the light may be focused on the microscope condenser. Sub-stage condensers for low power photographing are long focus and large aperture, such as the Zeiss "Brillingsglas." For high power work, the apochromatic short focus condenser is used.

No one brand or kind of plate can be recommended for all type of photomicrographs. In general, double coated orthochromatic or panchromatic plates are used with rather full development in a metol-hydrochinone developer. Such a combination gives great density to the pores and other open spaces of the wood structure, and at the same time retains full detail and gradation in the denser areas. Color filters or screens are used to increase or decrease contrasts. If contrasts are to be increased, a filter, complementary in color to the stain used, is employed, and if less contrast is needed to hold details within the denser

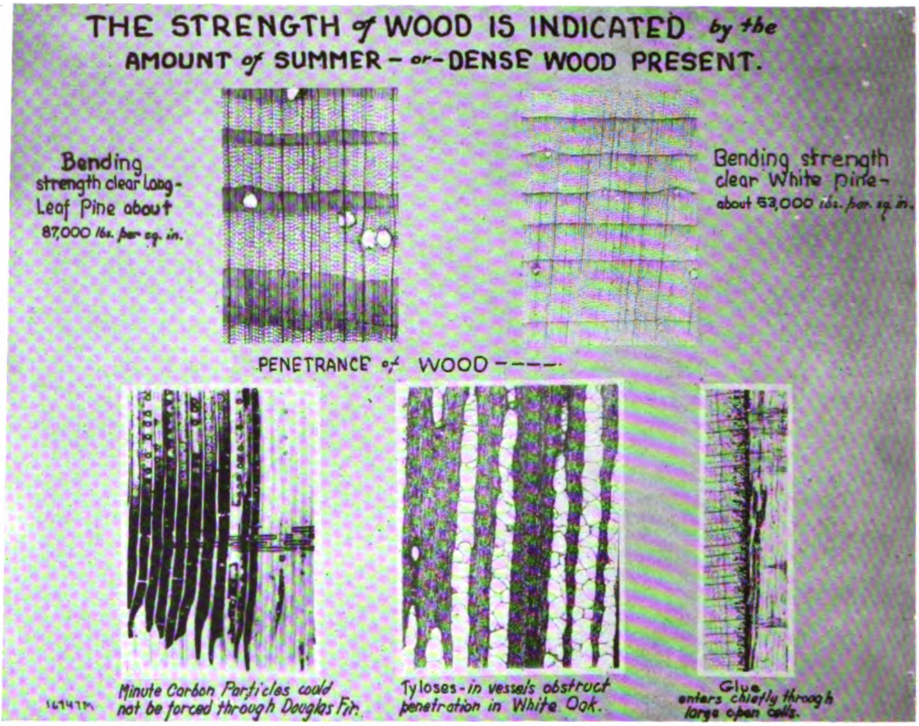


FIG. 8

structure, a filter of like color to the stain accomplishes much. In the latter instance filters colored by the same stain used in making the wood section work admirably.

If a photomicrographic apparatus is not in perfect optical alignment, something which is rather difficult for the inexperienced to secure and to maintain if magnifications are frequently changed, a chromatic fringe will be seen bordering the finer details of the image. This fringe seriously affects the definition of the photograph, especially in the higher magnifications, and can be remedied to a considerable extent by the use of a filter such as a green which eliminates most of the spectrum. This principle is also applicable when inexpensive, partially or uncorrected lenses are used on the microscope.

In the photomicrographic work of the Forest Products Laboratory magnifications range from 7½ to 1000 diameters, the greater number being either 50 to 250, the standardized magnifications which facilitate comparisons. On account of the investigative character of the work, and the necessary portrayal of specific details, recourse is taken to the use of the adapted color screens, panchromatic plates, special developers and unique dark-room manipulations, whose combinations and applications are limited only by the variety of problems presented.

MECHANICAL IMPROVEMENTS IN MOTION PICTURE WORK*—C. W. GIBBS

THE motion picture, as we see it on the screen today, is quite different from the motion picture we saw in the early days of the industry. There are improvements in many fields that have helped to bring about the present perfection in motion pictures. By a study of the transactions of the Society of Motion Picture Engineers, it can be seen what a large subject motion picture engineering is. You will find listed in the transactions of the society papers on projection, optics, cameras, films, studios, incandescent lamps, machinery, photography, projection screens, theatre design and many other subjects. As modern developments in all the different branches of motion picture work would be too numerous to mention in one paper, I will limit my subject to the recent important improvements in the mechanics of the apparatus.

The motion picture camera has been the subject of more improvements than any other piece of apparatus connected with motion pictures. The modern motion picture cameras are of fine construction and nearly perfect—quite a change from the cameras of the early days of the industry, which were wooden boxes, simple in construction, mechanism and permitting of but few adjustments; practically the only thing a cameraman did in those days was to turn the crank. With the present day outfits the cameraman must be a skillful and ingenious operator to take advantage of all the different devices that may be attached to the camera for producing special and unusual work.

There are many imposing features on the new cameras. The focal plane shutter, that permits of an opening of 230 degrees, is one of the most important innovations that have been brought out. This extremely large opening is useful in many ways in photographic work It will enable the cameraman to get proper exposure on dull days, use less light in the studio, to stop down the lens and increase the depth of focus, to take slow motion pictures at three or four times normal speed and to use a wider variety of light filters without changing the cranking speed. All of these points are very desirable in motion picture work.

In mounting the lens, the best design of recent date is the turret mount. The turret mount is a circular piece of metal, pivoted in the centre and having on its surface holders for a plurality of lenses. Any one of the lenses may be placed in the position over the film by turning the disk around. This changing from one lens to another without threading and unthreading them is quite a time saver.

The question of focusing the lens on the film is a problem. Lenses are usually in focusing mounts that are calibrated to different distances, but very few cameramen trust to these markings; usually the focusing is done by stopping the camera and focusing on the film. This method takes up time and is impractical in many cases. The best solution of this problem that has been adopted is the using of a pair of matched lenses with synchronized adjustments.

* Read before the Technical Photographic and Microscopical Society at the annual meeting in New York, September 14, 1922.

One of the lenses is used in taking the picture while the other is focused on a ground-glass that the operator has under observation at all times.

All-metal construction is now practically universal among manufacturers of motion picture cameras today. The metal cameras are no heavier than the old wooden models and besides, have the advantage of being able to stand hard knocks and a wide variation of temperature.

The cranking on motion picture cameras has been a subject of considerable discussion among cameramen. Nearly every cameraman has his own idea as to the amount of turns to crank a minute; even if he has the right idea, his cranking may not be correct, and besides, after cranking for an extended period, the cameraman experiences fatigue, which results in either uneven cranking or a change of speed. Many cameras are now fitted with an electric motor that has driving speeds of from one to thirty-two or more frames per second. This motor is equipped with a sensitive governor that permits of but little variation from the desired speed. The motor drive has eliminated the personal factor with its attendant variations.

The taking of pictures at a high rate of speed, commonly known as slow motion photography, is a very important development. Ordinarily the motion picture camera is cranked at a speed of sixteen pictures per second. Cameras recently built for this type of photography have reached speeds eight or ten times the normal rate and all indications point to much higher speeds in the future. The field of slow motion photography, up to the present time, has been barely touched but, because of the its great use in science, it will soon assume larger proportions.

There are a great many mechanical devices that may be attached to the cameras to aid in producing work that is out of the ordinary. These attachments include external diaphragms to produce the effect known as irising, masks to have the picture framed in dark borders of different forms, double exposure attachments to permit of one person appearing in two or more positions in the same scene and many other refinements that the cameraman uses to obtain the interesting effects that we see on the screen today.

There has only been one tripod of recent design that departs radically from the old types. This tripod has incorporated in it features that are not found in any other tripod. The legs are of simple construction and are easy to adjust. The lock to hold the legs in position is a short bar with a thread on either end. This bar is placed between the two components of the movable section of each leg and the unlocking and locking is accomplished by turning the bar around When locked, this tripod is extremely rigid, surprising indeed when the weight of ten and three-quarters pounds is taken into consideration. The head of the tripod incorporates a ball and socket movement, which permits of adjusting the position of the camera without moving the legs of the tripod. The ball and socket head may be removed with the camera and placed on any convenient support. In cases where weight is an important factor, this head may be left off and the camera mounted directly on the tripod. On the ball and socket head are carried the pam and tilt movements. The pam and tilt may be worked

simultaneously with one hand, on all other tripods two hands are required to work the pam and tilt at the same time. Taken as a whole, this tripod is the most practical type on the market.

The motion picture projectors have been the subject for a large amount of investigation by motion picture engineers, but there is room for much more improvement. However, the projector, as it stands today, is a great advance over the types in use some years ago. All of the modern projectors are similar in construction. They are all of solid, rugged construction, mounted on a heavy base, driven by an electric motor, have easy access to the film, in case of accident and are provided with means to prevent the spread of fire. The early models of projection apparatus were hand driven, were liable to burst into flame at any time, and their operation was very crude. In the essential features the machines have changed very little, practically all the tendency in projection machine manufacture has been toward the improvement of the design of the machine rather than toward new principles in projection.

The greatest improvement in projection is the using of incandescent lamps as a light source in place of an arc lamp. Incandescent lamps are much simpler in operation; when once adjusted, the lamps require no further attention and steady illumination is assured. The lamp manufacturers have done a vast amount of research in developing lamps for this style of work and have produced lamps of very high efficiency.

The shutters on the projectors are wasteful of light and there have been many attempts to improve them. One of the most recent innovations, that shows promise, is a shutter with complementary colored segments in place of the opaque segments generally used. During the pull down period or that section of time in which the film is in motion, the screen is illuminated and not dark as is the case when opaque shutters are used. This illumination of the screen helps, to a great extent, in decreasing the flicker of the picture.

Another method for improving the shutter has been invented, though it has not been used commercially, and that is the continuous projector. This projector has a picture on the screen continuously, there being no dark period. This results in 100 per cent lighting efficiency as against the 50 per cent of the ordinary projectors. One of the features of this machine is the high rate of speed with which pictures may be projected by it. In one demonstration, pictures were projected at a speed of over ten times the normal projection rate. This high speed would not be possible with a projector of the intermittent type.

There are many other improvements in the mechanics of the apparatus used in the taking and projecting of motion pictures that have not been mentioned in this paper, but for the sake of briefness, only the most important inventions have been spoken of. I would recommend that those who would care to know more of this subject that they consult the following references:

Transactions of the Society of Motion Picture Engineers.

"Cinema Handbook," by A. C. Lescarboura.

"Motion Picture Handbook," by F. H. Richardson.

THE USE OF A MICROSCOPE IN A TEXTILE SCHOOL*

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THE subject of this paper deals with the use of the microscope by the general course students only, and specially by students, part of whose course is taken in the chemistry department. As textile students spend but one day each week in that department, they naturally do not have the same amount of time as the chemistry course students, and do not use the microscope to the same extent.

In this course one of the first lectures describes the appearance of the various fibers. The students are shown how to mount the fibers, using water or glycerin for temporary mounts; the various parts of the microscope such as oculars, objectives, stages, etc., are explained to each student separately.

The fibers mounted consist of cotton, wool, silk, artificial silk, flax and ramie. Every student is allowed thirty minutes in which to examine and draw pictures of each fiber. The study of immature or damaged fibers is not taken up at this time, but is given in one of the other courses. With but thirty minutes time for this work, it is truly surprising to see the good work that is done by these novices with the microscope.

To keep the actual characteristics of the fibers permanently before them, the students are supplied with photomicrographs of the various fibers, these micrographs being taken, developed and printed by the advanced students of the chemistry department. The drawings and micrographs are used later on in a test of unknown cloth to help identify the fibers.

In the second year of the course starches are studied, and here the microscope is of the greatest value, as by no other means has it been possible definitely to identify the various starches.

As with the fibers, the students mount their own samples, putting seven starches on one slide; using potato, corn, wheat, tapioca, sago, arrowroot, and at least one other kind. Each student is allowed thirty minutes in which to study the characteristic shapes and hilums of these samples and to draw pictures. Having to use the microscope and draw pictures seems to impress these characteristics much more firmly on their minds than simply looking at pictures in books. Photomicrographs made by advanced students are also given in this case as with the fibers.

A test is given as follows: the instructor mounts six samples on a slide, using different arrangement for each student. Then the student is allowed thirty minutes to use the microscope and identify the samples on his slide. In the past three years only two students have failed to pass this test, which shows that the use of microscope in this particular case is quickly mastered by these students. Such tests are of value to textile men who are buying starches in large quantity,

* Read before the Technical Photographic and Microscopical Society at the first annual meeting in New York, September 14, 1922.

as they can quickly and easily tell, by using the microscope, whether they are getting the kind of starch that is desired. So here a microscope is a necessity as it may save time and money.

In getting the pasting point of starches, the microscope is also used by this class. It is a well-known fact that all starches do not paste at the same temperatures, some requiring a much higher temperature than others, so tests are made as follows: starch and water are mixed and placed on a water bath and the temperature is gradually raised and noted. Drops are put on slides using one slide for each starch, and noting the temperature. The slide is then examined with the microscope with a low power objective, and the point at which all the starch granules have become ruptured is easily determined, and the fact shown that this temperature is the proper one at which to cook this kind of starch without wasting heat.

As the starches do not all paste at the same temperature, this test helps to supplement the identification of the untreated granules of starch, which have been examined with the microscope.

In the final part of this course, these students are given samples of cloth that have been specially woven for these tests, using the various fibers. By chemical tests and by use of the microscope they must determine quantitatively the amount and kind of each fiber. The cloth is pulled apart and the fibers examined with the microscope, using the drawings and the photomicrographs that were made in the first part of the course as an aid.

From the foregoing it is readily seen that the microscope is an important instrument in our Textile School, even for this particular group of students who use it less than many of the other classes. Graduates say that even this small amount of work, with this valuable instrument, has often been of value to them in the mill.

As the other departments of the school all use the microscope for various parts of their course such as examining immature or damaged fibers, various weaves, identification of fibers, etc., we would not be able to get along without the instrument.

COPYING LINE WORK

THE copying of line subjects, such as engravings and documents, demands a different procedure than that followed when gradation of light and shade is desired. For line work the negative must have intensity and contrast. The dark portions of the original, such as the lines of a drawing, or the writing of a document should be represented on the negative practically transparent; "clear glass," as the worker says, and the high-lights, that is, the surface—generally paper—on which the drawing is made, must be opaque.

Special plates are on the market suitable for this work. They contain a moderate amount of silver iodide with considerable silver bromide. For this reason a moderate, but not excessive, addition of potassium bromide is made to the developer.

I wish to set forth briefly my plan of carrying out line copying and recommend it as giving, in my experience, better and more uniform results than the methods generally used.

I use a slow isochromatic plate. The copy is illuminated in the usual way, *i.e.*, the light directly in front, so as to avoid shadow effects from the grain of the paper, which lateral lighting will cause. The exposure should be full, but not excessive, and the lens stopped down only enough to cut off oblique rays, which will act like diffuse light, and thus interfere with the desired result. The stopping should, therefore, be just sufficient to get the parallel rays from the copy.

It is well known that orthochromatic plates tend toward giving intensity in the negative. On this account a strong development is not desirable if half-tones or a nice gradation is required. Hence for portraiture a somewhat dilute developing solution is to be used, especially with rapid plates, but in the work under consideration I recommend a rather concentrated developer, with, as noted above, only a moderate amount of potassium bromide—that is, less than the proportion usually employed. I use only hydroquinone, sodium sulphite and potassium carbonate. The following formulas have been satisfactory:

A

Hydroquinone	4 gm.
Sod. sulphite (dry)	15 gm.
Water	300 c.c.

B

Potassium carbonate	30 gm.
Water	300 c.c.

Bromide in small amount.

For use mix equal parts of these and use without dilution. Allow the image to attain the maximum density, which may be readily judged by looking through it. If the plate is kept as much as possible from the ruby light during the development, there is no danger of fog, and the action may be prolonged until the image is clearly seen on the back of the plate.

I wish to note here that hydroquinone is especially susceptible to temperature, a cold solution may be nearly inactive, therefore the temperature of the developing fluid should not be below 60 degrees F. (15.5 degrees C.). This peculiarity of hydroquinone should be borne in mind in making the solution.

When sufficient intensity is obtained, the plate is placed in a weak acid bath for a few minutes, rinsed and fixed either in plain hypo or in the acid fixing bath. I prefer the plain bath, as I have found the acid fixing bath to produce at times a slight opalescence. A negative made in this manner rarely needs any further treatment for increasing intensity.

Orthochromatic plates have a special advantage over other forms in the copying of old manuscripts, which are apt to be yellow in the high-lights. The orthochromatism here acts specially in securing a negative which gives a perfectly white background in the reproduction.

BENEFIT FROM VARIATION IN METHOD

IT is a natural human tendency to remain satisfied with what has been accomplished when results seem worthy of self-appreciation, presupposing the faculty of honest autocriticism.

We are all prone to follow the advice to "let well enough alone" rather than to venture on doubtful procedure. Many a good work has been spoiled in the revision where the heat of the original inspiration has cooled down to the temperature of staid contemplation, but withal it is hostile to progress to keep invention to one particular mood, even though it seems a thing of supreme endeavor, for fear of hurting our reputation by striking out on some line of variation.

As pertinent to our professional practice—let us say that in the lighting of the model in our studio, our individual work is apt to have a certain specific uniformity of merit, arising essentially from the discovery we may have made, experimentally or accidentally, that certain conditions have resulted in the production of something admirable, meeting the general approbation of the artistic critic, for which we have been accorded deserved commendation. Well and good. Take the praise for what it is worth, and crown ourselves with our self-plucked laurels, but do not let self-adulation cripple our efforts to going still higher.

Do not fall into the common error, too many fall into, of utilizing the acquired knowledge and ability for general practice, from which there must be no deviation, instead of regarding it as a means only of specific application, and as an incentive to higher effort.

Do not imagine that the limit of your possibilities has been reached in the belief that you have discovered the only suitable conditions for all work done under your facilities of illumination. Look around and devise new methods by modification in surroundings, or by observing subjects from other angles of view.

We are cognizant of the possible impediments confronting new and untried venture, the temptation from favorable environment in the old method, which assured success in advance—and we appreciate the risk of meeting factors, unlooked for and difficult to encounter, but you must make the adventure to equip yourself with the needed versatility in the treatment of the varied subjects which present themselves to your consideration.

You must drill yourself to determine, almost at the first view of the subject, what is at once to be done.

Do not trust to the help from any momentary inspiration, but have at command, on the instant, the power of application, derived from previous experimental study; and this advice is as much applicable to posing as to illumination. Indeed, we are inclined to think that the posing of the model is something less easily acquired than skill in lighting, inasmuch as the art of illumination may be mastered with considerable completeness, that is, one may experimentally determine the scope and measure of his scheme of lighting, and bring it down

to manageable mechanical principles for artistic application, whereas posing may never be completely comprehended, because it is less amenable to mechanical rules and is more largely an outcome of personal artistic endowment.

Posing is so manifold in its activities, unconditioned, calling for such knowledge of harmony of relation of lines and distribution of masses, that possession of the artistic temperament is presupposed. An operator often fails in characteristic poses than in good illumination. He fails in the same way that painters fail, who pose poorly, while they show much skill in color and illu-

We have been told that the fault with many a good photographer lies rather in his inability to generalize; that he is too liberal in his translation of the original, but we fail to see how truth can militate against exhibition of fine effect. It is something added, and in portraiture something essential, and something evaded by those who have not ability to get likeness and artistic effect at the same time. But the photo-artist must possess his mind with the fact that there are impediments, incident upon photographic practice, hostile to artistic endeavor. At its best, photography has a tendency to over-emphasize defects in the original. As artists, we must study how to overcome these impediments. We have not the facile means which the painter has at command; and inasmuch as he never hesitates to make use of such, we think we have justification in using any means to minimize defects not traceable to our want of artistic instinct.

RUTH DRAPER NICKOLAS MURAY

From the Members' Exhibit of The Camera Club, New York

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Reduction of the Image

There are many methods employed for reduction of the over intensified developed image. The reducing agents may be divided into two groups. First, those agents which act uniformily in reducing shadows and high lights; and second, those acting proportionally, that is, attacking more energetically the densest areas.

In the first is placed the combination of ferric-chloride and citric acid, and also the time-honored and respected "Farmers" solution, a mixture of potassium ferricyanide and hypo.

In the second category is placed preeminently, the persulphate of ammonium. Hydrogen peroxide, in an acid solution (Andersen), is another, and also the reducer first recommended by Namias—potassium permanganate in acid solution.

These proportional reducers are somewhat erratic in behavior, even to the extent of refusing to work at all. As regards trustworthiness, the Farmer's solution stands perhaps in advance of all, despite the uniformity of its action, which naturally reduces the image too contrasty, altering the values of the light and shade in the negative, which is anything but desirable to the photographer of pictorial instincts.

The perchloride of iron and citric acid reducer is a very powerful agent and of particular value to the commercial photographer who is desirous of getting great contrasts, as in line reproductions, plans, engravings, etc. But the pictorialist looks to the Farmer's solution for the amelioration of his improperly developed negative.

It is not as well-known as it deserves to be that this reducer can be put in the category of proportional reducers, by a mere modification of its contents; notwithstanding, our frequent advocacy of the improved method. It may be interesting to learn how this improvement was discovered, for this one good reason at least, because it demonstrates the value of observation of behavior of things which do not seem to be of any particular account.

How many a good thing in our art may have been lost to the profession because no attention was taken of it. We might have waited longer for the discovery of the daguerreotype had the discoverer not been a man who was determined to find the cause of some accidental presentation. It was the noting of the difference of effect had by reduction of the negative while thoroughly saturated with the hyposulphite of soda and when thoroughly washed therefrom which gave the idea.

On a time this happened, and the conception was naturally had, that the great improvement in the more harmonious presentation of high-light and shadow must be due to the excess of the hyposulphite of soda content over that of the ferricyanide (red prussiate) of potassium. Accordingly the old formula was reconstructed.

Farmer's original formula called for 1 part of the 10% solution of ferricyanide of potassium to 5 parts of the 10% solution of hypo and the only change made is in increase of proportion of hypo content from 5 parts to 20 parts.

The action, of course, is much slower, but just here we think may be found the cause of the difference of effect. We are all aware how much better tonal values of exposure are preserved by employment of a dilute developer, instead of a concentrated one. Why? Let us venture to say, because the developing fluid penetrates through the film before any decided action can begin; that is, a preferential action of the active developer for the weak shadows is induced by strong developer.

Because mild action is insured, when it begins from the back of the plate forward, from the lowest stratum of the plate to the superficies, instead of from front to back.

This attempt to account for the improvement in the action of the hypo-diluted Farmer's solution, by making it analagous to the action of weak developer, may be incorrect, but you will find the improved Farmer's solution does what is claimed, gives proportional reduction.

Action of Light in Producing Chemical Change

There is some hesitation amongst scientists just now relative to the nature of light. The old theories have been disturbed considerably since the discovery of radiant energy, but we can presume to say light is a form of radiant energy and has the power to set up chemical changes in matter. But as far as photography is concerned, the availability of only a few reactions is possible. Photographic processes all depend upon the power of luminous action to dissociations.

Many oxides, chlorides, bromides, iodides and other combinations, which are stable in the dark, are readily excited by light, dissociated, giving off oxygen, chlorine, iodine, etc. Others require the presence of some other body which combines with the liberated negative element. Light, too, has the power of producing compounds not formed in the dark. These reactions probably belong to the same category as the previously mentioned bodies, for light acts on free chlorine and probably on free oxygen, exactly in the same way that it does when these are associated. It facilitates the breaking up of the molecules.

The well-known formation of hydrochloric acid forms its elements by the action of light, the chlorization of hydrogen, the decomposition of water by free chlorine with formation of hydrochloric acid, and the addition of chlorine or bromine to nonsaturated compounds, such as carbonmonoxide, sulphurous anhydride, all appear to be due to this cause, since the decomposition of the chlorine molecules must precede the act of combination. In this way, all the effects of light may, like those of heat, be regarded as an act of decomposition or dissociation, followed by combination, and may be considered from the same standpoint. According to former ideas, the effects of light were considered, partly as acts of combination and partly of decomposition. The blue-violet and ultra violet rays are the most active. The red rays having the minimum energy.

The decomposition of carbonic acid in the plant is caused more directly by red and yellow rays and is scarcely affected by the more refrangible rays. There are also other chemical actions which are more influenced by the red and yellow than by the blue.

Since the absorption of red and yellow rays by substances produces a greater rise of temperature than is caused by blue and violet rays, it would seem that the change is not due to the heat, but to the light, that is, the varying of the wave lengths in the ether.

It has been long known that the chemical action of chlorine is produced by exactly that kind of light which it absorbs. Light which has passed through a layer of chlorine gas ceases to have any further action on the chlorine. This shows conversion of energy. There are bodies, certain salts of silver, in especial, which, after exposure to light, acquire the property of being reduced by oxidizable bodies. It is not necessary for the oxidizable body to be present when the exposure is made. Silver bromide, exposed to the light (sensitive plate), where the exhibition of change is manifest, responds to the action of the developer, and the silver is reduced only where the light has acted. Light acts as a dissociator and facilitates escape of the ions.

The fact that the condition of the exposed silver salt persists for a considerable time after exposure while in the case of chlorine, which is not associated with hydrogen, it ceases after light action ceases is analagous to what happens in phosphorescence.

Positives Directly on Bromide Papers

G. Bani, in *Photo-Revue*, describes at some length a process of his own devising which he regards as simpler and more satisfactory than those heretofore advised for making of positives direct on development papers. The author evidently writes from Italy, but no information is given as to whether the French journal published the article as a translation or original paper. The high price of glass is one of the influences that have led to the study of this subject. It is, of course, true that the operator obtains only one picture by a given exposure, but this is occasionally all that is wanted, and is economical when large sizes are required. The older procedures involved much detail, but Bani's method requires but a few, and gives satisfactory results, though naturally susceptible of improvement. Different qualities of bromide paper behave somewhat differently in the process. In general the brilliant grades are most suitable. Incidentally it is stated that he has used, with success, a grade termed "Fasa," which bears a

British mark, but which he thinks is really made in Germany.

The exposure in the camera is the same as that for plates of moderate rapidity. The operations are development; sulphuration; reversal; clearing. The solutions are as follows:

A—Developer.

This is a solution containing metol and hydroquinone of the usual strength, but with addition of 0.5% of potassium metabisulphite, 0.4% of boric acid, and 0.1% of potassium bromide.

B—Sulphuration. A stock solution is made of:

Water	100 c. c.
Sodium hydroxide (1% sol.)	25 c. c.
Lithium carbonate	1 gram
Sulpho-urea	4 grams

C—Special developer:

Water	400 c. c.
Metol	2 grams
Potassium metabisulphite	2 grams
Potassium Bromide	1 gram

D—Sulphurizing (diluted ready for use):

Solution B	30 c. c.
Solution potassium carbonate (15%)	30 c. c.
Solution of chloral hydrate (0.4%)	20 c. c.
Solution C.	5 c. c.

(In regard to chloral hydrate, see below)

E—Reversal:

Water	400 c. c.
Potassium bichromate	3 grams
Nitric acid	5 c. c.

F—Clearing:

(a)	Water	650 c. c.
	Hypo	45 grams
	Sodium sulphite (dry)	5 grams
(b)	Water	300 c. c.
	Potassium ferricyanide (red)	3 grams

Equal parts of A and B are mixed when needed.

The sulphurizing bath calls for a small amount of chloral hydrate. This is designated in the original as "chloralium," but a footnote gives the chemical formula and properties so as to indicate clearly what is meant. It may be, however, that the substance can be obtained only on prescription by a registered physician. The clearing bath is practically Farmer's solution.

The procedure is as follows:

The paper is developed in bath A to a good intensity and transferred without washing to bath D. These operations obviously must be carried on in a safe light, until the sulphuration is complete, when diffuse light may be admitted. Sulphuration is complete when the paper has become brownish-red. It is washed in a few changes of water to avoid blisters and then passed into solution E, which in a few minutes will destroy entirely the negative image, leaving only the positive one, the color of which will depend on the proportion of silver iodide or chloride in the coating, similar to what would have been obtained by the use of alkaline sulphides. The print is washed briefly, cleared in solution F and, if desired, toned by a subsequent operation. The procedure is recommended for those who desire to experiment in new processes. It seems complicated on account of the number of solutions prescribed, but with the exception of the chloral hydrate, the substances are quite familiar to photographers.

A Woman Photomicroscopist

Mary A. Booth, photomicroscopist of international fame and one of the leading women of science in this country, died suddenly in her home in Springfield, Mass., on September 16th. She was seventy-nine years old. Miss Booth was born in Longmeadow, Mass., and was educated in the schools of that town and in Wilbraham. Because of the importance of her work she was constantly appealed to by surgeons and scientists to aid in their work. She traveled extensively in Canada, Alaska and America, and wrote a number of scientific books and articles and delivered numerous lectures. Miss Booth became especially well-known when Surgeon-General Blue was waging his successful campaign against bubonic plague in San Francisco in 1907-08, when she made the photomicrographs of the germ bearing fleas of rats for the stereopticon slides. During its whole existence Miss Booth was the editor of *Practical Microscopy*. She was a member of the American Microscopical Society, the New York Microscopical Society, and the Brooklyn Institute of Arts and Sciences and a fellow of the American Association for the Advancement of Science, and of the Royal Microscopical Society of London, England.

Smithsonian Collection at the Camera Club

FLOYD VAIL, F. R. P. S.

A unique exhibition of pictorial photography was held at The Camera Club, New York, during the month of September, 1922, consisting of a large loan collection from the Smithsonian Institution (United States National Museum), Washington, D. C. Our Government has been collecting for many years, from all over the world, examples of photographic art by the most conspicuous and successful exponents of different periods, beginning with Daguerre down through the days of H. P. Robinson, Julia Margaret Cameron, to Kuhn, the Hofmeisters, Demachy on to the present time; these all embodied in a permanent collection on view constantly at the United States National Museum, for the study and enjoyment of all the people of the United States, if they avail themselves of it when in Washington, and is worth a special trip to all interested in photography, both for its pictorial features and technical aspects, with specimens of photographic apparatus and instruments included. Unfortunately, few know of the existence of the unusual advantages afforded by our Government.

The loan collection at The Camera Club, New York, presented only the work of present-day pictorialists, and was one of the finest displays of artistic photography ever shown anywhere in this country, or at The Camera Club, where the best is always on view.

J. Craig Annan, of Scotland, whose outstanding work has been known not only abroad, where he is a member of the London Salon of Photography, but in this country and others, showed twelve of his delightful examples, in photogravure, which for scenic interest, beauty of texture and high quality is rarely approached. His group embraced "A Bullock Cart," "St. Martin's Bridge," "Old Well, Toledo," "Blind Musician," "Quarryman, Toledo," "Gypsy Returning from Market," "At Stirling Castle," "A Utrech Pastoral" and his celebrated "Miss Janet Burnet."

Malcom Arbuthnot, England, exhibited "Afternoon Tea" and "Fulworth Cove."

Angus Basil, of London, presented five examples, a male and a female nude of rare excellence and three portraits, one of these that of a man with a ruff collar being exceptional for modeling and strength.

Charles Borup, England, ranked high with his "F. J. Mortimer," familiar to readers of THE JOURNAL from appearing with the reproductions of Mr. Mortimer's work in the issues of last year, in "Winter," "Summer," "Happy Sally," "Muriel Gregory," "Phyllis and Crinolin" and "An Old Artist."

S. Bridgen, F.R.P.S., of England, attracted much attention with his five large pictures, particularly his rendering of "Windswept," "God's Light" and "In a Thames Wharf."

J. H. Coatsworth, of Egypt, was unusually striking with "An Old Bedouin," "Hagar Nawatia," "The School Mosque" and "A Street in Damanhour."

Fred Judge, F.R.P.S., also well known to Americans by his one-man show at The Camera Club and reproductions, scored, as always, with three of his delicate, surpassingly beautiful bromoil transfers, "On the Marshes," "Approaching Storm" and "Pastures by the Sea," with low horizons and a wealth of sky and cloud forms, after the manner of our American painter, Groll.

Alexander Keighley, F.R.P.S., of Steeton, Yorkshire, England, needs no introduction to Americans. He was again seen and admired in seven superlative carbons: "The Sheik's Tomb," "The Harp of the Winds," "Grace Before Meat," "A Pilgrimage to Mont St. Michel," "A Spring Idyll," "The City Gate" and a new one, "The Ravine."

J. Arthur Lomax, F.R.P.S., of Wales, was particularly effective with a portrait of "A Girl Drinking" and a nice little landscape.

Leonard Misonne, of Belgium, was represented by five of his unsurpassed landscapes in oil. Inasmuch as this celebrated pictorialist will give a one-man show during November, and possibly December, at The Camera Club, New York, consisting of fifty examples made specially for the occasion, and most of them heretofore never exhibited, I will reserve my remarks for a future review of his work.

Richard Polak, of Holland, exemplified Frans Hals in his portraits and Vermeer in his interiors—"The Man with the Scroll," "Portrait of a Woman, Seated," "The Thirsty Girl," "La Malade Imaginaire," "A Pretty Little Song" and "The Parrot."

Guido Rey, of Italy, had twenty-three of his familiar renderings of characters in period dress, exquisite in textural beauty, delightful in pose and spacing and altogether charming.

Kate Smith, of London, and Louis J. Steele, of Portsmouth, were characteristic-

ally represented, the former by a single print, "Arcadian Angler," and the latter by two large, impressive specimens, among the best in the collection—"The Cobblers" and "A Venetian Study."

There were eighty-four selected pictures in all, outstanding in merit. Too much praise cannot be given to our famous National Museum for collecting and maintaining a history of photography for all time and from all time; for its courtesy in permitting its exhibition for the good of the public and its hearty co-operation in the advancement of the cause, always.

The exhibition attracted unusual numbers and one heard nothing but praise.

Focal Lengths and Plate Sizes

A good many years ago the late T. R. Dallmeyer wrote an interesting little book, entitled "A Simple Guide to the Choice of a Lens." It was a curious feature of this publication that, although it was full of valuable information on lens matters generally, there was only one point in it which justified the title. In one place it did recommend the choice for all-round work, of a lens having a focal length equal to the diagonal of the plate upon which it would most often be used. There was, of course, nothing novel in this recommendation. For a score of years previously lenses of the more rapid types had been listed for the various standard sizes of plate on practically this basis, that is to say, the normal focal length for a ¼-plate was 5½ inches; for a 4 x 5, 6 to 6½ inches; for a half-plate, 8¼ inches, and so on. Although it is impossible to trace the origin of this standard, many years of experience have proved its advisability, and the novice in lens buying will do well to be guided by it.

It must not, however, be assumed that there is any fetish in this proportion, for in many cases a much greater comparative focal length will be found to give better results, while in others a shorter one, giving a wider angle, is sometimes demanded by the nature of the subject. It has been urged by some writers that the focal length of the lens should be equal to the distance at which the resulting photograph would be viewed, and that the average distance for people with normal vision being 14 inches, all photographs, no matter what their dimensions, should be taken with a 14-inch lens. This is manifestly absurd, in view of the very large proportion of photographs which are taken upon plates smaller than whole plate, upon which size a 14-inch lens might profitably be employed with most subjects. It must never be forgotten that perspective is governed entirely by the view-point, and is not affected either by the construction or focal length of the lens, provided that the same angle is included. This can be demonstrated by taking one negative with a double lens and, without moving the camera, another with one of the components; upon enlarging the central portion of the first negative until the details are exactly the size of those in the second, it will be found that the outlines exactly coincide.

Wide angle lenses, that is, lenses whose focal length is short in relation to the plates they are used upon, are responsible for much of the bad reputation which photography has earned among artists. The artist, either consciously or instinctively, reconstructs his perspective when he is drawing a subject in a confined position. But the photographer has no such power. Provided that his lens is rectilinear, he is forced to put up with a correct rendering in linear perspective, no matter how offensive to the trained eye it may appear. Wide angles are a necessary evil in many branches of commercial photography; they should be avoided by the artistic worker, unless he has a definite object in employing them.

In classifying lenses no attention should be paid to any descriptive engraving upon the mount. For all practical purposes, the focal length and the extreme size of plate which can be covered are the necessary data; apart from the intensity or speed, these indicate the limits of their usefulness. For example, a 12-inch wide angle landscape lens, made to cover a 10 x 12 plate, may do more effective service as a narrow-angle lens upon a 4 x 5. Conversely, a 5½-inch anastigmat, normally a quarter-plate lens, may be used at a pinch as a wide-angle lens upon a whole plate.

The original type of telephoto lens, especially when of rather low power, is an instrument which has never been appreciated at its true value by the great majority of photographers for either technical or artistic work. Like many other new inventions, it fell into the hands of the "stunt-mongers," who strained its capabilities to the utmost, and created an impression that it was unsuitable for everyday work. The great merit of this type is its possession of a variable focal length, so that with the same lens the desired angle can be embraced upon practically any size of plate. With a

moderate power attachment the normal plate is covered with a minimum equivalent focal length of three times that of the positive lens. Thus, using an eight-inch rectilinear and a four-inch negative attachment, an equivalent focal length of 24 inches is obtained with a camera extension of eight inches, while for every four inches of camera extension, eight inches are added to the focal length. When objects at a considerable distance have to be taken, there is often a lack of contrast, but this is due to the atmospheric conditions, and not to the lens. It may be minimized by using a slow "contrasty" plate and developing fully.

The modern one-focal-length telephoto lenses, such as the Teleros, Dallon and Cooke, differ only from ordinary lenses in that they only require for distant objects a camera extension of about half their equivalent focal length. These lenses have somewhat limited covering power, and cannot be used for anything like the normal angle, so that it should always be considered whether, in purchasing, say, a 16-inch lens, it would be advantageous to procure an anastigmat which would cover up to 10 x 12, or a telephoto of the same aperture which would cover less than a whole plate. —*The British Journal of Photography.*

Death of Major-General Waterhouse

From *The British Journal of Photography* we learn of the death, on Thursday, September 28, of Major-General James Waterhouse, in his 81st year. He was buried in the graveyard of Eltham Parish Church, when the ceremony took the form of a full military funeral, attended by the band of the Royal Artillery.

General Waterhouse, late Assistant Surveyor-General of India, was born July 24, 1842, and received his education at University College School and King's College, London.

In 1859 he joined the Bengal Artillery, and spent the following 38 years in the Indian Army, during which time photography played no unimportant part in his eventful career. In 1861-2 he was commissioned to photograph the native tribes of Central India, and during the next few years was stationed in many places, including Saugor, Delhi, various hill stations and Allahabad, till June, 1866, when he was transferred to the Bengal Staff Corps, and a month later appointed to the charge of the photographic operations in the Surveyor-General's Office at Calcutta, which post he held till his retirement in 1897.

Before taking up this work, however, Major-General Waterhouse spent five months in the offices of the Great Trigonometrical Survey at Dehra Dun, in order to undergo a course of training in photo-zincography, finally taking up his duties in Calcutta in November, 1866.

During the period of more than 30 years in which Major-General Waterhouse occupied this important post he worked out officially many improvements in photo-zincography, photo-collotype, and other processes of reproduction used in the office, and introduced the waxed sand process of heliogravure. He also took part in several important expeditions, being deputed to assist Colonel J. F. Tennant, R. E., in photographing the total eclipse of the sun at Dodabetta in December, 1871, also the transit of Venus in December, 1874, and was in charge of the Indian Eclipse Expedition to Camorta in 1875.

During his residence in Calcutta General Waterhouse did much valuable experimental work. He was the first to experiment with eosine as a color-sensitizer. This was in 1875, when he published his results as to its properties in rendering haloid salts of silver sensitive to yellow light. Another of his important discoveries was the extreme sensitiveness for the red and ultra-red spectrum imparted to gelatine dry-plates by ammoniacal solution of alizarine blue.

In 1890 he was awarded the Progress Medal of the Royal Photographic Society for his spectrographic observations of the action of dyes on dry plates and for orthochromatic photography, and in the same year discovered and investigated the curious action of small quantities of thiocarbamide added to an alkaline developer in reversing the photographic image on dry plates, and showed its application to photo-engraving.

In 1893 he investigated the electrical action of light upon silver, the results of which were published in the *Journal of the Bengal Asiastic Society*, and in 1895 was awarded a Voigtländer medal by the Vienna Photographic Society for his researches in scientific photography.

Since his return to Europe in 1897 General Waterhouse had carried out a number of investigations relating to the scientific side of photography, including the sensitiveness to light of silver and some other metals and the direct *visible* images obtained thereon, and had made several interesting discoveries regarding the early

history of the camera-obscura, the telephotographic lens, and the photography with salts of silver. Many of his results have been published in the pages of *The Photographic Journal*, *The British Journal of Photography*, and other technical and scientific papers.

General Waterhouse was president of the Royal Photographic Society in the years 1905 to 1907, a period when the politics of the Society were by no means quiet, and probably were not particularly congenial to one of his peaceful temperament. A man of a most amiable and modest nature, his passing will be deeply regretted by the great number of those of the older generation in photography who had occasion to benefit from his great stores of knowledge and his invariable readiness to lay them at the disposal of inquirers.

Real Causes of Blisters

Blisters on prints are seldom due to any fault in manufacture of papers, but they may be produced on any gelatine paper by improper manipulation. The best way to prevent blisters is to understand their causes—the remedies then become obvious.

Blisters may form on prints during developing, fixing, washing or toning, or partly during either operation. Their formation during development is a rare occurrence. The same is true of fixing, unless the print is transferred direct from a strongly alkaline developer to a strongly acid short stop bath or fixing solution, in which case small bubbles of gas are formed within the gelatine film because of the action of the acid on the alkaline carbonate. The formation of gas in the gelatine is over the entire surface of the print. If for any reason the gelatine film has become softened, a small gas balloon is formed under each weak spot where gas is being liberated, resulting in blisters or so-called air bells. If the developer is not too alkaline or the acid short stop or fixing bath is not too acid, and prints are rinsed after developing, such blisters are not formed.

Air bells or blisters are liable to occur if the water used for washing contains an excess of dissolved air. Water under high pressure is usually the cause of the trouble. The water contains a great amount of dissolved air and the gelatine emulsion is saturated with water. If the temperature of the water is slightly raised, this air is expelled with the result that it may raise the gelatine and form an air bell. If the gelatine has been properly hardened the air bells are not so likely to form. If this trouble is a persistent one, the remedy would be an open tank into which the water could be drawn from the tap. This relieves the pressure and allows the air to escape.

All blisters, however, are not gas or air blisters. They are often filled with liquid, in which case they are caused by the phenomenon of osmosis.

If a solution of a salt such as hypo is inclosed within the gelatine film of a print and the print is immersed in water, there is a tendency for the water to penetrate the film at a greater rate than the hypo solution diffuses out. An internal pressure is thus created within the gelatine (and especially at the point of contact of the gelatine film and the paper support) which is known as the osmotic pressure of the hypo.

If by any means, therefore, the adhesion of the film and paper in any particular spot has become weakened, or if by swelling or softening or for any other reason the gelatine has become less porous in one spot than in another, the water will penetrate the gelatine film faster at that spot than the hypo diffuses out, with the result that a blister will form.

This osmotic pressure is often great enough to break the gelatine film. If the gelatine has been properly hardened and the print carefully handled, the gelatine should be uniformly porous and no such trouble experienced.

Most blisters are formed during washing after fixing, and their production is assisted by the presence of cracks, creases, or folds in the paper, since wherever these occur the gelatine film is likely to be broken away from the paper support.

Likewise, any factor in manipulation which tends to soften the gelatine locally tends to produce blisters. A powerful spray of water will soften the gelatine in the spot where it strikes the print, and touching the print with warm fingers will soften the print at the point of contact.

Washing at high temperatures should be avoided as much as possible, and in all cases the temperature of the various solutions should be maintained as nearly the same as possible. A frequent cause of blisters is the transference of prints from a warm fixing bath to cold water, and vice versa. In cold weather keep a fixing bath where it will be as cold as the water used for washing.

Apart from the effect of temperature, the

use of alkaline wash water or an alkaline fixing bath, caused by carrying developer into the fixing bath with the prints, will tend to soften the gelatine and produce a condition favorable to blisters. It is important then to maintain the acidity of the fixing bath, or use a fresh bath at all times.

Blisters formed during after-treatment are usually caused by toning, and may be due to insufficient hardening, the use of one of the acid bleaching baths, an excessively strong sulphiding bath or too hot a hypo-alum bath, together with one or all of the above causes. If a print is not thoroughly hardened and is placed in a very hot hypo-alum toning bath, it will soften before the alum can begin its hardening action.

If, during final washing, it is seen that blisters have formed, the paper underneath may be pricked and the water squeezed out, or the print may be immersed in equal parts of water and alcohol, followed by a bath of alcohol alone. It is better, however, to prevent toning blisters by drying prints before toning, or better still, by treating with a 3 per cent. solution of formaline after washing and before toning, with or without drying, if there is any reason to believe prints may not be sufficiently hardened to withstand toning.—*Studio Light.*

A Two-Color Process of Additive Color Cinematography

[The obtaining of more perfect blending of colors, and the possibility of making color films to normal artificial light, are claimed in a recent British patent specification No. 183,150, in the name of Messrs. R. O. P. Humphrey and Claude H. Friese-Greene. The invention provides a rotating disc, having an aperture admitting white light, with which is incorporated a section or phase of blue filter, and also a red filter section. The red filter is graded in density, so that the densest end is slightly deeper in color than the actual depth required by a filter of constant density. Exposure therefore commences, to light of low intensity but correct color, and gradually increases in intensity as the shutter moves across the lens. The blue filter, which is used in conjunction with the aperture admitting white light, is intended to increase the color value on the blue side. This filter can be varied in area or intensity to suit any particular conditions of light, or nature of subject. The positive pictures are colored in the usual manner, those taken through the color filter being tinted orange-red, and those exposed to white light with the color phase, tinted blue-green. The resulting pictures may be shown at a speed more approximating that at which the usual black and white picture is shown. But it is suggested, that it is desirable in practice, to speed up the intermittent motion of the camera so as to lessen the time taken in moving portions of the film successively into position for exposure. This "quickening up" of the motion of the film allows the use of filters of large area, thus increasing the speed of exposure and reducing color fringing to a minimum.]

The usual disc containing two apertures is utilized, and is rotated at half the speed of the shutter. One aperture allows the passage of white light with a color phase, which may suitably be of a blue-green shade. The other aperture is filled with a transparent filter colored for example a shade between yellow and red. The aperture allowing the passage of the white light with a color phase, is preferably adjustable in area so as to obtain a balance with the color filter. Such aperture may be sub-divided into two or more apertures, if desired, which further apertures are preferably disposed on the opposite sides of the line passing through the axis of the disc and the middle of the aperture containing the color filter. The essential is that the total of the areas of the sub-divided apertures should approximately equal the area of a single aperture when such only is employed.

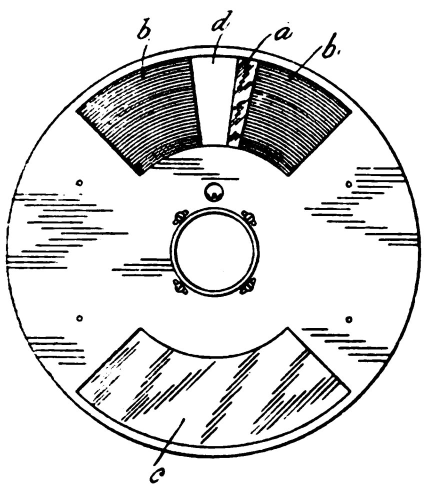
By sub-dividing the aperture allowing the passage of white light with a color phase into two or more sections, and by disposing two of such sections as close as possible to the ends of the aperture containing the color filter, displacement is minimized between the two pictures taken during each revolution of the disc and, as a consequence, color fringing in the projected positives is also minimized.

In practice, the best results are obtained by gradually diminishing the intensity of the colored filter from one end of the aperture to the other, the exposure being made either first through the densest end of the filter or through the lightest end.

The gradual varying of the density of the color filter is of great practical importance, inasmuch as it operates to reduce the period of exposure which would otherwise be required were the light passed through a filter in which the required color was of uniform density. The color at the densest

end is slightly denser than the color which would normally be required in a screen of constant density. The first part of the exposure is thus made with light of a low intensity, but of the required color, which light then gradually increases in intensity as the aperture is moved across the path of the light passing through the lens.

It will be seen that the essential feature of the invention is the taking of one picture through a color filter adapted to exclude white light but to transmit light at the red end of the spectrum, and the taking of the other or succeeding picture by exposing the particular surface of the panchromatic or color sensitive emulsion to white light with a color phase which is of less value than the white light.



The positive pictures are colored in the usual manner, the picture taken through the color filter being tinted orange-red, and the picture taken by exposure to white light with a color phase, being tinted blue-green.

In the drawing *a* represents a blue-green phase, *b* a filling of opaque material, and *c* a color filter the color of which is on the red side of the spectrum.

The following is one complete application of the invention when using the arrangement illustrated in the drawing.

Area of white light aperture=.6233 sq. inches.

Area of blue-green filter=.255 sq. inches.

The blue-green filter *a* is colored with the following solution:—

Solution A:—
Rapid green .... 10 grs.
Distilled water .... 10 ozs.

Solution B:—
Patent blue .... 10 grs.
Distilled water .... 20 ozs.

These solutions are mixed as follows:—

1¼ ounces of solution A and 1¾ ounces of solution B. To this mixture is added four ounces of distilled water.

The transparent filter material, preferably having a gelatine base, is immersed in the above solution for one minute, after which it is rinsed in distilled water for fifteen seconds and then allowed to dry.

Filter *c* is colored by immersion in the following solution:—

Flavazine T .... 10 grs.
Distilled water .... 10 ozs.

The flavazine T is dissolved in the distilled water. The solution is applied to the filter material by means of a brush so as to obtain the gradual effect previously referred to in this specification.

The density and area of the color filter *c* is determined by test so as to balance with the aperture for white light and the blue green color phase.

The positive film is colored by direct application of blue-green and orange-red coloring alternately, the blue-green being applied to the portion of the film corresponding to that portion of the negative which has been exposed to light passing through the white aperture and the blue phase and the orange-red to the portion of the film corresponding to that portion of the negative which has been exposed to light passing through the flavazine filter. One suitable solution for coloring the blue-green picture is as follows:—

Solution A:—
Rapid green .... 10 grs.
Distilled water .... 10 ozs.

Solution B:—
Patent blue .... 10 grs.
Distilled water .... 20 ozs.

To a mixture of one ounce of solution A and two ounces of solution B add two ounces of distilled water.

The solution for coloring the orange-red picture is as follows:—

Solution A:—
Fast red D .... 10 grs.
Distilled water .... 11 ozs.

Solution B:—
Flavazine T .... 10 grs.
Distilled water .... 10 ozs.

To a mixture of three ounces of solution A and half-an-ounce of solution B add three ounces of distilled water.—*The British Journal of Photography.*

Using D. P. as P. O. P.

A note in *Photo-Revue* says that it is not generally known that ordinary chlorobromide development papers are capable of direct printing. The exposure must be very long, the writer, in fact, suggests that the arrangement be made and the printing frame exposed in the morning, and when the amateur returns home after the business day, the print will be complete and will require merely fixing and washing. Journals are always searching for something new to spring on their readers, but it may be said of the above suggestion that it is more curious than useful.

Blueness in Autochromes

It was found that a particular batch of Autochrome plates of the year 1920 showed a marked bluish tint, an observation which occasioned the writer to go into the subject, although the existence of the tint was denied by MM. Lumière. In later work it was noticed that the Autochromes no longer exhibited this predominant tint, the reason for which was found to be that, by an error, a Von Hübl light-filter of greater depth than the standard one for Autochrome work had been employed.

As regards variation in the mosaic screen itself of the Autochrome plate, this is an unimportant factor, and M. F. Monpillard has already remarked that the cause of a predominant blue tint is to be sought elsewhere, namely, in a difference in the color-sensitiveness of the emulsion. It is, of course, obvious that if the color-sensitiveness for red-orange rays is diminished from any cause, the use of the standard light-filter will give rise to a predominant blue tint in the transparencies.

This blue tint may be corrected, or even completely avoided, by one or other of several means. As has been suggested by M. Schitz, the Lumière light-filter may be supplemented by one of the Wratten K1 screens, employed, in addition to the standard Lumière filter, for about one-quarter of the exposure. M. Monpillard has also found that the Auto J screen of his manufacture, if used in conjunction with the Lumière screen, for the whole period of the exposure, is satisfactory.

My own preference has been for the use of a single screen somewhat deeper than the Lumière standard. Having a variety of screens at hand, I made a series of tests by photographing the same subject successively with different screens. A white object was always included, since the rendering of white may be readily observed, and a screen is found to be correct if white is rendered as white. A range of grey objects of different depths was likewise included, since any predominant tint makes itself more evident over parts which should appear as grey.

As a result of these tests, made by using Autochrome plates derived from nine different batches of emulsion, it was found that in summer the Autochromes made with the standard Lumière screen gave a bluish tint, even when exposure was correct or in excess of the correct time. The tint shows itself more or less strongly according to the variations of the emulsion, and also to those of the illumination at the time of making the exposure. This latter was examined with the "coloriscope" of Von Hübl, and was never found to be pure white. However, notable variations in the bluish color of the prevailing light could be observed. As a general rule this blue coloration is less intense when the sky is pale blue, with some clouds or completely clouded, than when it is very blue. But on certain days it could be observed that the blue color of the prevailing light was as intense with a lightly clouded sky as on another day when the whole sky was a strong blue.

Tests made with the Monpillard Auto J. screen, such as was adopted as a standard by M. Monpillard before the war, gave a prevailing yellow tint with the recent Autochrome plates which I used. The explanation of this unexpected fact has not yet been found. Likewise a prevailing yellow tint was obtained with a Von Hübl screen of much greater depth than the normal, the time of exposure being increased by slightly over 50 per cent. But the transparencies obtained, despite a slight yellow tint in the whites, are of more agreeable color rendering than the colder results obtained with the standard Lumière filter. A screen such as this appears to be suitable for specially blue conditions of light, such as occur, for example, in the photography of snowscapes, where the shadows are very blue.

Of all the other screens which I have tested, the most notable is undoubtedly the Von Hübl filter, having a slightly greater depth than the standard. The time of exposure requires to be increased by about one-fifth. The depth of this screen is only a little greater than that of the standard. Looked at by reflected light (laid on a sheet of white paper), it appears identical with

the standard Lumière filter and does not show the reddish tint of the normal Von Hübl screen. In fact, it appears clearer than this latter. But examined by transmitted light its color is yellower than that of the standard Lumière and Von Hübl screens, which are identical in appearance when viewed by transmitted light. This arises from the fact that only the yellowness in the screen is greater, whilst the red is the same as in the normal Von Hübl screen. The following are the formulæ for the normal screen and for the B, as given by Von Hübl in his "Theorie und Praxis der Farbenphotographie."

	B Screen	Normal Screen
10 per cent. gelatine solution	38 vols.	40 vols.
Filter Yellow K, 1:200 solution	16 "	14 "
Solid red D (Echt-rot D Hoechst) 1:2000 solution	16 "	14 "

The colored gelatine solution is flowed on to glass in the proportion of 7 c.c.s. per square decimetre.

With this somewhat deeper screen the transparencies obtained on eight different emulsions, out of nine which were used in the month of June, were free from bluish tint, both with a blue sky and with one which was completely clouded, whilst the same subject photographed at the same time with a standard screen invariably showed the bluish tint. The ninth emulsion differed from the others in that it yielded a bluish tint even with the deeper B screen of Von Hübl. On the other hand this emulsion required at least double the exposure as compared with the others exposed under the same conditions of light.

Whilst the bluish tint appears when the old standard screen is used for the daylight exposures, such is not the case when employing artificial illumination from a light rich in yellow-orange rays and containing a sub-normal proportion of blue and violet rays. These latter, being less intense in comparison with the others, the blue tint does not appear. Transparencies made on recent Autochrome plates, using a Nernst lamp with the special Von Hübl screen, or Perchlora flash powder with the Lumière Perchlora screen, showed no trace of a blue tint.—Eugene Muller in *Le Photographe.* Translated by *The British Journal of Photography.*

Recent Patents

1,423,809. Photographic-View Finder. In a finder, the combination of a base member, a clamping member thereon, a supporting member slidably mounted on said base member, a plurality of sighting devices supported thereon, a clamping member on said supporting member, and resilient means for moving said clamping members into engagement with a camera.

1,424,062. High-Temperature Development of Photographic Materials. A composition for treating gelatine-surfaced photographic materials for hardening them only, comprising a substance adapted to yield formaldehyde together with a relatively greater amount of a salt of the known class which tends to raise the melting point of a gelatine jelly and to retard or restrict the swelling of gelatine in water.

1,422,410. Shutter for Motion-Picture Projecting Machines. A motion-picture projecting-machine shutter comprising in combination, a hub, a blade fixed relatively to the hub, a plurality of blades shiftable circumferentially relatively to the hub and the fixed blade for varying the number of light-obstructions presented by the shutter per revolution, and means for limiting the circumferential movement of the shiftable blades relatively to the fixed blade, the shiftable blades being circumferentially spaced from the fixed blade throughout their limit of movement.

1,422,461. Iris Diaphragm. In an iris diaphragm, the combination of a casing having an aperture there through, said casing having a slot and provided with a circumferential groove in its outer wall, a diaphragm comprising a plurality of movable wings for controlling the admission of light through said aperture, a movable ring for controlling the position of the wings, a second ring movable in the groove in the external wall of the casing, and a lug on said second ring projecting through the slot in the casing wall and operatively connected with the first mentioned ring.

1,423,997. Automatic Focusing Device for Enlarging Cameras. A device of the character described comprising a track, a camera carrier movable longitudinally thereof, a lever pivoted to said camera carrier, means of imparting swinging movement to the lever as the camera carrier moves longitudinally of the track, a rod extending longitudinally of said camera carrier and slidably connected therewith, lens board engaging means adjustably connected with said rod and extending therefrom for connection with the lens board of a camera, and means connecting the lower end of the rod with the inner end portion of said lever.

1,423,224. Iris Diaphragm. An iris diaphragm comprising two ring members, one of which is mounted to turn on the other, and blades pivotally connected to one of said ring members extending through the opening of the other ring member and pivotally connected to such other ring member.

1,422,460. Photographic Shutter. In a shutter, the combination of a casing having an aperture there through, a plurality of blades movably mounted in said casing for opening and closing said aperture, each of said blades having an opening for admitting light from the margin of the aperture simultaneously with the admission of light from the center thereof during the opening and closing movements of the blades, and means for moving the blades.

1,417,832. Photoprinting Machine. An intermittently operating motor operated photo printing machine, including an exposure regulating device, lamps for making the prints, circuits for supplying current to the operating motor and the lamps, said circuits being controlled by said exposure regulating device, means for holding a negative, a feeding mechanism for feeding a strip of sheet material, said feeding mechanism including a carrier connected to the motor for intermittent reciprocation, a gripping device on said carrier to grip the paper when the carrier moves from the negative, a stationary gripping device to grip the paper when the carrier moves toward the negative and means to lift the paper from the negative while it is being advanced by the carrier.

1,421,156. Objective for Photographic and Like Purposes. An objective corrected for spherical aberration, coma, astigmatism and curvature, as well as for chromatic aberrations capable of being made with a very large relative aperture made up of (1) a front component consisting of a positive lens made of crown glass of high refractive index in the vicinity of 1.6 or 1.61 and having low dispersion, cemented to a negative lens of flint glass of not greater refractive index, the former leading and being bi-convex; (2) a middle component consisting of a bi-concave negative lens of a flint glass of refractive index less by at least .04 than that of the crown glass used in the positive lenses of the system and having a dispersion at least as great as that of either of the flint glasses used for the other dispersive lenses of the system; (3) a back component, similar in type to the front component but reversed, that is, with the dispersive lens towards the front, the glasses being in type similar to but not necessarily identical with those used in the front component, substantially as described.

1,422,341. Photographic Film Rack. As a new article of manufacture, a film rack comprising a U-shaped frame, a clamping bar having guides carried by its ends for slidably engaging the side bars of the frame, said side bars terminating in horizontal arms, as and for the purpose set forth.

1,419,385. Photometer Chart. In combination with a camera object finder having a ground glass; a chart divided into a number of sectors, each of said sectors bearing graduated colors and a central aperture formed in said chart affording means for direct comparison of said graduated colors with a shadow of an object present in the said object finder, substantially as described.

1,421,279. Process of Cinematography in Natural Colors. A process of taking or projecting motion pictures in color, comprising taking or projecting an image or scene in sets of four color records, two of the records being of primary colors, and two being records of two colors whose combination constitute the third primary color complemental to the colors of the two primary color records aforesaid, and interposing a moving colored screen having the four colors selected, each colored part of the screen having a varying color tone.

Dyes as Accelerators in Development

Lüppo-Cramer having stated that basic dyes are accelerators, Liesegang reports in *Photographische Industrie*, that this is true only of some dyes and with normal hydrochinone solutions, that is, those containing a sulphite and an alkaline carbonate or caustic alkali. Some basic colors act as retarders, especially in developers containing no alkaline substance and those not containing hydrochinone. It is, therefore, largely a matter of the relation of hydrochinone to the colors. Liesegang has suggested that the reduced silver may be present under two different forms, one porous and intensely black, the other compact and white by reflection. The latter was of the kind that was preferred on the ferrotype and similar forms. He is of the opinion that the basic colors in the developer will prevent the formation of the compact form and tend to increase the proportion of the porous deposit.

A joint meeting of the Technical Photographic and Microscopical Society and the Society of Chemical Industry will be held in Rumford Hall, Chemists' Club, New York City, on Friday evening, December 15, 1922.

A New Spanish Photographic Journal

A short time ago, notice was made of the appearance of a new photographic journal—*Foto Revista*—published at Buenos Aires. Another Spanish journal is now added to the list, this coming from the other side of the Andes. *El Arte Fotografico* is published at Valparaiso, Chile, under the direction of Julio Salcedo. It will appear monthly, and will, as the name indicates be devoted largely to the artistic side of photography, but will not neglect the technical applications. The first number is at hand and contains several very finely executed pictures, an illustrated article on photomicrography, and an account of the development of color photography. The latter article is to be continued through several numbers, and will be a valuable contribution to the history of an important phase of photography. The journal is about the usual magazine size and is well printed on excellent paper. Some space is devoted to listing the names and addresses of photographic societies. The first list is that of societies in England, which will be followed by lists of those in other important countries. These lists will promote intercommunication between photographers, especially amateurs in different parts of the world.

Selenium Toning Processes

Next to the toning processes, which involve the employment of the so-called noble metals: gold, platinum and palladium, which are most practical and live up to their ascribed virtues, we may mention the substitution toning methods as claiming attention just now. Attention to them is the more to be considered, as little is known relative to their character and effect.

Of these new toning processes, the latest presented is that of the selenium compounds, which theoretically as well as practically are of considerable interest, and so at present occupy much attention.

The selenium process is capable of general application, inasmuch as it may be used, not only for printing-out paper, (P. O. P.), but also for pure chloride papers or for developing papers containing a goodly percentage of silver chloride.

The tones, to be sure, are not as various as those possible with the noble metals, but are most pleasing and agreeable to the current demands, and besides easy of management.

The tones produced resemble the tones had with the sulphuration methods. The selenium toning is characterized as a toning method depending on the building up of the image in selenium deposit.

This is understandable, when one bears in mind the relationship, chemically, between selenium and sulphur.

A positive proof that the selenium tone is produced, follows without necessity of substantiation of chemical demonstration, from the practical proof that no effect with it is had upon a silver bromide print, while striking results accrue when a selenium bath is used with it on papers having rich content of chloride of silver (P. O. P.), toning very rapidly, while it is possible, with use of a sulphur bath, to have a toning both with bromide and gas-light papers.

Furthermore, one can see that the method is analagous in action to the toning methods with uranium, copper and other salts, in presentation of the colloidal condition of the selenium.

According to Dr. Kiefer, the red colloidal selenium has the property of a color substance, and colors cotton or wool when immersed in it, or gelatine which imbibes it.

It is also highly probable that the selenium silver or the metallic silver, is in a fine state of division as is deposited from silver chloride; the red selenium is attracted and incorporated in it and from the mixture of the black and red we have the reddish brown result of selenium tone. The decomposition of silver by sulphur in the formation of a silver sulphide takes place more readily and more completely the finer the state of division of the silver and the case is the same as far as concerns selenium.

Inasmuch then as the silver grain of the image on a bromide of silver print is comparatively large to that forming the image of a chloride of silver picture, it is easily understandable that this latter sort of paper should be more responsive where selenium is concerned.

It is, moreover, worth taking note, that the thickness of the silver deposit has likewise influence in affecting the color of the tone. In thick layer we have a darker and in thin layer a lighter tone. Hence the character of the negative from which the print was made is to be considered. Influence of color of the image is also indicated, hence different tones are possible, violet-black, brown-black and red-brown, according to duration of the toning operation.

The brilliancy of the toned image, of course, is dependent upon the character of the developed image, which implies that the

tone is richer proportional to the depth of silver deposit in print. Hence prints from strong negatives give the richer results. But inasmuch as there is an attendant alkaline reaction accompanying the toning with selenium, care must be taken as to the quality (body) of the paper support. It must be tough enough to resist. The final tone obtained is of a brown violet.

Intermediate tones are more difficult to secure uniformly than this ultimate tone. Hence it is important to use toning baths specially constituted to get intermediate tones, such as are controllable.

Durability of tone is a desideratum in all toning processes, but reasoning from analogy with sulphur toning, one may safely predict permanency for selenium.

Permanency, to be sure, depends upon the conditions surrounding the prints, but, under ordinary conditions, we may have assurance of long life. One need never fear, however, attack of "yellowing" incident upon some modes of toning manipulation.—*Das Atelier.*

Airplane Photography at the Antipodes

Harrington's *Photographic Journal*, one of our regular visitors from the other side of the world, gives in a recent issue a fine series of views of Sydney and vicinity; taken from about 1000 feet. One view, entitled the "Heart of the City" shows that the sky-scraper has become a feature of antipodal life, although no buildings are yet in evidence equal to the enormous piles that American cities are now constructing. The American term, "sky-scraper," has been translated into French and German with but slight modification of significance. The Germans call them "Wolkenkratzer" (cloud-scratchers) and the French "gratte-ciel," practically a literal translation of the English term. The views of Sydney, the principal city of New South Wales, presumably the most important one of the British dominions in the southern hemisphere, show very attractive spots, but the average conditions are much like those of the cities of the north. A rectangular arrangement of street dominates, but there are narrow alleys and also blind ones, both of which are great burdens in the problems of the modern cities. There seems also to be a lack of diagonal avenues.

All the views are of excellent quality and the reproductions have been very well made. Milton C. Kent, who made the pictures, gives a description of his experiences, and also much information as to the general subject of airplane photography. He found that above 1000 feet all sense of speed is lost, for even when looking down on the earth the impression obtained is that of slow traveling. It is impossible to see anything, even the pilot in front of you, when going through a cloud-bank and the only definite evidence you have of your surroundings is the hum of the engine. All sense of direction is lost in a cloud-bank, and, on one occasion, the pilot thought he was going horizontally, when the plane was really climbing in a nearly vertical position; gravitation acted and the plane began to fall, but fortunately the earth came into view in time to right the condition and prevent disaster.

Want of Luminosity in the Shadowed Side of the Face

Studios having the desirable north light present no difficulty to the photographic portraitist in getting that most pleasing phenomenon of luminous shadows. Of course, we presuppose the operator knows how to manipulate his illumination, inasmuch as one ignorant of the means cannot hope even with the best equipped studios to get fine results. But what we desire just here is to call to the attention of those who have appreciation of the value of luminous shadows in portraiture that the eye may sometimes be led to a false judgment of what the light really is effecting on the film.

We must not forget the mechanical phase of our art, or that our camera is no discerner of persons, and relentlessly registers intensities in proportion to potency without appreciation of external appearance. What we mean is that contrasts are always stronger in the photographic picture than they appear to the eye.

Frequently the shadow side of the head seems to our vision full of the richest detail, and truly it is, but in the finished portrait we discover that for some unaccountable reason (our deductions being based on appearances) some of the seemingly delightful luminous shadow areas are in the photographs mere spots of unmeaning blackness.

When it is intended that the shadows shall not appear altogether black, we must either introduce direct light on the shadow side or rearrange our illumination to throw light in that direction. To the eye the effect on the model becomes visible.

By increasing the amount of front light the time of exposure becomes relatively shortened. The light and shadow contrasts become more and more decided by approaching the sitter to the source of light.

It is best to use the reflecting screen with caution; that is, not to overdose the shadow side so as to destroy by a flood of reflected illumination the fine gradations.

If the studio is not large the reflections are often sufficient for all purposes when they come from the walls; that is, using the wall in more or less area, as may be found sufficient.

The agency of the light reflected from the floor is often overlooked. It lights up the lower shadows.

Every radiating object near the sitter acts as a reflector, and it sometimes happens that a charming result has been obtained without the operator perceiving the immediate cause of his success. Of course, he tells the admirers of the result; that it all was carefully sought out. This reflecting agent of good may have been a book which the artist found necessary for the line composition, but he builded better than he knew, or it may have been radiations from some piece of apparel worn by the sitter. Whatever the cause the credit is the photographer's if he subsequently appropriates it.

Further Notes on Vanadium Toning

In THE PHOTOGRAPHIC JOURNAL OF AMERICA for October, 1922, a note was given concerning a method of Vanadium toning formulated by Spitzmuller. A communication from L. Löbel, in the *Photo-Revue* shows that the method is not at all new, having been described originally by Namais in 1902 and employed on a large scale in toning motion picture films, until the invention of the methods of toning by dyes. Some time ago Löbel devised formulas for the use of vanadium which are more easily prepared than that given by Spitzmuller. Among the advantages are: avoiding the use of a solution of ferric chloride, the strength of which is variable. Elimination of ferric oxalate, which is somewhat difficult to obtain and is somewhat sensitive to light. The substitution is obtained by using a solution of ferric alum (ferric ammonium sulphate) which is a salt in familiar use, of good quality and stable under ordinary conditions. Other advantages over Spitzmuller's formula are no precipitate if enough of oxalic acid is used and good keeping qualities.

Löbel gives the following formula:

Solution of ferric ammonium alum	25 c.c.
Commercial vanadium chloride.	1 gram
Potassium ferricyanide (red) solution (10%)	2 c.c.
Oxalic acid solution (10%)....	60 c.c.
Common alum solution (10%).	10 c.c.
Hydrochloric acid (10%)......	5 c.c.
Water, enough to make........	1000 c.c.

There are some vague points about this formula, as is so often noted in French journals. In the original, the amount of vanadium chloride is given 1 c.c., but this is evidently a typographical error—1 gram is surely meant. The strength of most of the solutions is given, but not that of the ferric alum. It is not clear whether the hydrochloric acid is directed to be 10% of real acid, which would be obtained if the commercial strong acid is diluted about 3½ times, or whether it is to be made by dilution of the commercial acid with 9 volumes of water, that is, an acid of about one-tenth the strength of the commercial. It is probable that the latter is intended. For trial the ferric alum solution may be made of 10% strength.

Amidol as a Developer

Amidol continues to attract attention. Formulas for its use have lately been given in this journal. It appears that experiments are now being made to convert it into a desensitizer, by a partial decomposition, through the action of recently precipitated silver bromide which has been well exposed to light. This action is termed an oxidation, though it is not clear why such a change should occur with substance used. It seems not unlikely that after while the developer will be the desensitizer, and then the work of developing can be conducted in the light. Another preservative for amidol is announced. This is glycolic acid, which is a derivative of acetic acid. It is now made in this country and is apparently not very expensive. The formula given for its use is:

Hot water	1 pint
Glycolic acid	1 grain
Sodium sulphite (dry)...........	½ ounce
Amidol	45 grains

The amidol should not be added until the sulphite is all dissolved.

New Sensitizers for the Deep Red

From the Research Laboratory of the Eastman Kodak Company, C. E. K. Mees and G. Gutekunst report the properties of several dyes selected out of a number investigated. The first of these is naphthacyanole, prepared by the condensation of betanaphthaquinaldin ethiodide with quinolin ethiodide in the presence of formaldehyde in alcoholic potash, the dye being a homologue of pinacyanol. It sensitizes with a strong maximum in the deep red at 6900 A. U. and a minimum in the green.

Acetaminocyanole was prepared by the condensation of 6-acetaminoquinaldin ethiodide with quinolin ethiodide in the presence of sodium ethylate and formaldehyde. This gave a maximum at 7300 A. U. It was unstable in the presence of small amounts of water and is not thought to be generally useful.

Kryptocyanin was prepared by the condensation of lepidine ethiodide as described by Adams and Haller. In normal concentrations it gives severe fog, but in dilute concentrations good results are obtained, the maximum being 7600 A. U. It is thus the most powerful sensitizer for the near infra-red known and is expected to have applications in astronomical photography. In the extreme infra-red, it is inferior to dicyanin.

Air Bubbles in the Lens

The Rev. F. C. Lambert, special London correspondent of the *Australasian Photo-Review*, gives in that journal some experiments made to demonstrate to a doubter that an air bubble does not interfere with the work of a lens except as a stop for the light. Each part of the lens acts for itself. If, therefore, a bubble should block out one-fiftieth of the total transmitted light, the operator would not be able to notice this. It is probable that not even so great a proportion is stopped in ordinary cases. The writer says that if a reputable house sends out a lens containing a small air bubble, it may be assumed that the efficiency has been duly tested and the bubble found to be of no practical moment.

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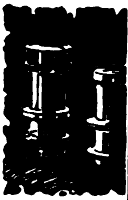

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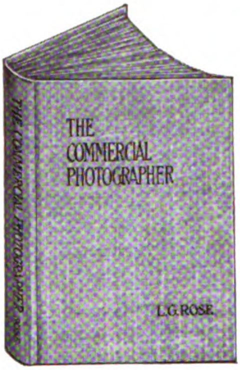

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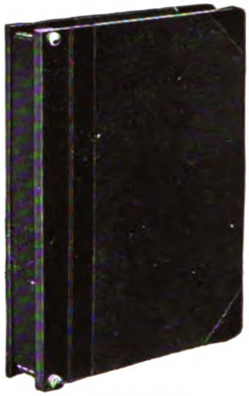

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A Monthly Magazine Devoted to the Science and Art of Photography

636 SOUTH FRANKLIN SQUARE, PHILADELPHIA

REPTILES AS SUBJECTS FOR OUR CAMERAS—L. W. BROWNELL

I THINK that I can see a shudder go through many of my readers when they see the title for the present article in my Nature series, but I can assure them that the shudder is without any real cause or reason, for the reptiles, when we come to know them, are as interesting as are any of the other of Nature's children and, in many cases, nearly, if not quite, as beautiful. Moreover they make excellent subjects for photography and I would earnestly advise my readers, who do not already know them, to go out and make their acquaintance. They will soon find themselves amply repaid for their trouble and will quickly discover that all their former prejudices were mistaken ones and to be placed among the old wives' tales along with the one concerning the mouth-sewing propensities of the Dragon-fly and others equally as ridiculous.

Under the name of Reptiles is to be classed, not only the snakes, of which there are many species, but the frogs and toads, the turtles and tortoises and the salamanders, lizards and newts. Among the first class, particularly, are many very handsome species. Surely there can be nothing more delicately beautiful than the little chamelion which was tethered at the end of a gold chain and worn by the ladies as a piece of jewelry, until it was stopped by the Society for the Prevention of Cruelty to Animals.

Before going further I wish to correct a fallacy which, unfortunately, most people believe, a belief which I have found it hard and, in some cases, almost impossible to shake. All our snakes are not poisonous. In fact it is directly the opposite and nearly all of them are entirely harmless. We have in the United States but four species of snakes that are poisonous. These are the

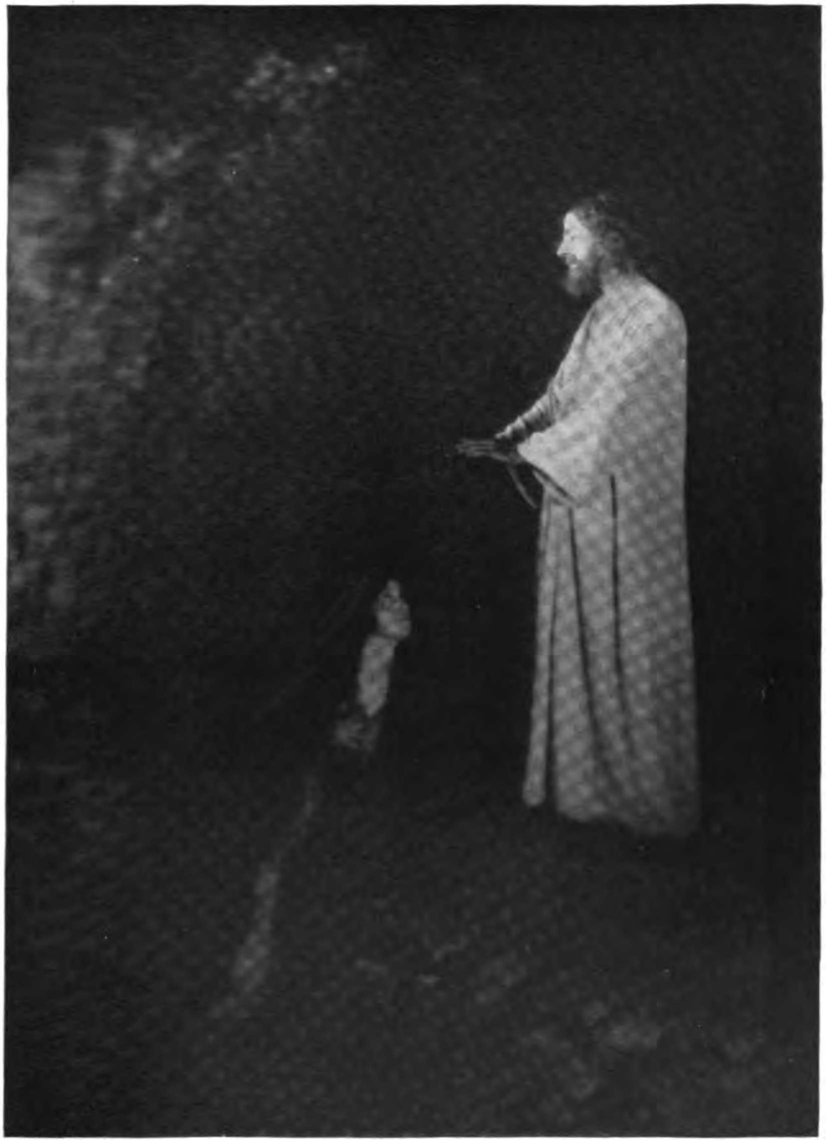
Rattlesnake, the Copperhead, the Moccasin and a little snake that is found only in the far southern portion of the country and which is known as the Coral snake. It is a beautiful little snake, alternately banded with red, yellow and black. It is very hard to anger and will not bite except under the greatest provocation, but when it does its bite is extremely dangerous and has been known, upon several occasions, to cause death. All the rest of our snakes are entirely harmless and their bite is no more to be feared than is that of a mosquito, in fact, not so much, for the mosquito will inject a poison, while the harmless snakes do not.

It is rather too bad that, from the earliest time, the snake should have been held up as the symbol of everything that is mean and vicious. The fact of the matter is that snakes are really beautiful and there is no other living creature that is one-half so graceful. Moreover, they are extremely useful animals from the agriculturist's point of view, for a couple of snakes, in an orchard or garden, will keep it free from nearly all destructive rodents and insects. The one and only offense that can be laid to the snake is that they are fond of eggs and young birds as food and will rob the nests whenever they have the opportunity. The ground breeding birds suffer considerably from their depredations, but not more so than from the marauding small boy.

There are many absolutely ludicrous tales told of the snakes that are believed by nearly all of the more ignorant and, I am sorry to say, many should know better. The "Hoop Snake" that, taking its tail in its mouth, forms a hoop of its body and rolls after its intended victim with incredible rapidity; the "Whip Snake," with a sting at the end of its tail, with which it strikes and kills

"GREEN AND LEOPARD FROGS"
PHOTOGRAPHED IN TANK

L. W. BROWNELL



"THE RESURRECTION" © J. W. BEATTIE

A scene from the "Life of the Christ," which is presented for several months each summer in the hills near Hollywood. The lighting effect used in the Play is a combination of incandescent floods and colored spots, and while very beautiful visually, these lights are practically non-photographic. The Play has been photographed before but always by daylight with results invariably disappointing because of too much detail and a lack of concentration.

"The Resurrection" is one of several negatives made one night after the performance by Beattie. One Hollywood Flood-Lite was used from back and to the right of camera and subdued to 20 amperes and screened by lowering the Lite back of a small headground, until detail in the composition was almost lost to the eye. For the concentration, one Hollywood Hi-Lite was focused onto the Christ from a hill to the left of picture. Detail in the hill-background was obtained by directing the subdued light of a second Flood onto the hill from behind a screen to the left. Exposures were "snap-shotted" with an ordinary studio shutter, Verito 11½-inch, diaphragmed to f11.

DR. FRANCIS L. PATTON ORREN JACK TURNER

its victim in much the same manner as one would use a quirt; the hypnotizing effect of a snake's eye and their ability to gain such control over their prey that they will fall easy victims, and many other myths equally as foolish.

As a matter of fact, the snake is more or less of a gentleman. His first instinct is to avoid mankind if possible; his second to show fight but only when forced to do so. Even the Rattlesnake will give warning when too closely approached, and will only strike as a last resource, and the Moccasin, that much-feared reptile of the south, is so sluggish that one may step over him, as I have done, without his showing any resentment in the matter.

The Rattlesnake is distributed pretty well over the entire United States, in different forms or subspecies, from the great Diamond-back Rattler of the south, that reaches a length of seven or eight feet and whose bite is almost sure death, to the little eastern rattler, seldom more than two feet in length, whose bite, while unpleasant and sometimes, under conditions favorable to the working of the poison, even fatal, may, in most cases, be easily cured. The Copperhead, the Rattlesnake's nearest relative, is distributed over the northeastern portion of the country but is nowhere very common, and both the Moccasin and the Coral snake are restricted to the south.

As subjects for our cameras, the snakes are extremely interesting, but do not enter into the spirit of the game as docilely as they might, in fact, I am inclined to think that they are among the most difficult subjects in the whole realm of Nature photography. As I have said, their first instinct, when too closely approached, is to run, and some of them, notably the so-called "Blue Racer," can accomplish this in a manner that is truly startling, for all that one can see of him, after he starts, is a mere streak in the grass. If, however, a snake is so cornered that he can find no easy way of escape, he will turn and

"SPOTTED TURTLE" L. W. BROWNELL

show fight. This is his only means of defense and he does it more to try to frighten his pursuer than for any real means that he possesses of winning the battle. It is at such a time, however, that the photographer must take his chance of a picture and, obviously, the reflecting type of camera is the one best suited for the work, as it is almost certain that during the time occupied in setting up and focusing a tripod outfit, the subject will have found ample opportunity to make his escape. I have, upon occasions, so tamed a snake by handling and stroking him gently, especially upon the head, that he has remained quietly in the position in which I placed him upon the ground until I had made a time exposure with my lens stopped down to bring everything into sharp focus. This, however, cannot always be done with entire success, and I fear that I cannot expect many of my readers to even try it, although there is little doubt but that they would soon learn, if they would only try to become better acquainted with them, that the snakes are far from being the completely repulsive creatures that they have been in the habit of considering them.

Another way in which good pictures may be made of the snakes, perhaps better than trying to make them in the fields, although I much prefer the latter method myself, is to catch your subject, if you can do so and are not afraid, and carry him home to photograph in the cage, which I have already described in my article on photographing the smaller mammals. In doing this, I wish to speak a word for the snake. Do not try to keep him too long in captivity. It is very difficult to force a snake to eat in captivity. In the zoological parks, they frequently have to resort to forcible feeding, by holding the snake and pushing the food down his throat in order to keep him from starving to death. While snakes can live for some days without food, they cannot live forever and one can never tell how long they have been without it when they are caught. It is

"MOCCASIN, COILED FOR A STRIKE" L. W. BROWNELL

"POUR LES MOISSOUNEURS" LEONARD MISONNE

From the One Man Show at The Camera Club, New York.

"LE SENTIER DES SAULES" LEONARD MISONNE

From the One Man Show at The Camera Club, New York.

therefore well to make your pictures and give your subject his liberty as soon as possible after capturing him, for even a snake should be treated humanely.

The turtles, tortoises, etc., are more easily photographed, for with them it is merely a case of finding your subject, the rest is easy. The minute one of the creatures is touched, he withdraws his head into his shell nor will he protrude it again immediately. During the time that he is in retirement, so to speak, one can pose him in any spot and in any position, and will have ample time to set up the camera and obtain a focus. It is possible to stop down the lens a little, if necessary, but be careful not to do so enough to materially lengthen the time of exposure, for it will be found that, when the subject finally decides to again view the world, he will not remain in that spot long but, even before his head and neck is completely extended, he will start to walk away. It may be found necessary to make several attempts, before an exposure can be made, with his head sufficiently exposed to show properly. This is the only difficulty with which one has to contend in the photographing of the turtles and is not a very serious one.

The frogs and toads are not such easy subjects but, on the other hand, the difficulties to overcome in order to obtain their pictures are not nearly so many as in the case of the snakes. There is an old superstition that the handling of toads will give one warts. This is, of course, arrant nonsense and both toads and frogs, any and all of them, may be handled with perfect impunity. Moreover, one can very soon tame one of these creatures by softly rubbing his head and back, until he will remain with apparently complete contentment in any position in which he is placed. In this manner perfect photographs of them may be obtained. Perhaps the most characteristic photographs of the frogs

"RIBBON SNAKE" L. W. BROWNELL

can be made in a tank for their natural habitat, of course, is the water and they look much more at home in their native element than on the dry ground. Any of the tanks sold for aquarium purposes is all that is required. One of the smaller sizes is best and it is well to have a piece of tin or zinc painted white on one side and of the right size to slip into the tank, in order to narrow the space between the front and back glass and also to shut out any incongruous objects that may show in the background. Thus we may confine our subjects to the front of the tank and easily maintain a sharp focus upon them, until they assume the pose we are waiting for. In a later article I intend giving more detailed instruction as to the use of a tank in Nature photography.

The salamanders, lizards and newts are more or less common almost everywhere throughout the United States. They are to be found under stones and old stumps, in ponds and lakes and stagnant pools and many of them are very pretty little creatures. In handling them one must be very gentle, as they are easily injured. They can be easily photographed either on the dry land or in the tank. Many of them, however, are aquatic in their habits and so the latter method would, naturally, seem to be the correct one in order to show them to the best advantage in their natural element.

To all those who do not know the reptiles and the lives that they live, it is my advice to go out and become acquainted. One can derive much pleasure from doing so.

THE PHOTOGRAPHER, THE MODEL AND THE ARTIST

THE artist uses models, and though he may exercise his imagination in delineating them upon his canvas, there is always a certain amount of realism about his productions from the living subject which enables us to recognize the special individual he has employed in his studio. And so, if we examine the work of noteworthy photographers, we shall discover that it is not so much the technical qualities which attract us, but the skill displayed in lighting, posing, and managing the model. As a general rule the photographer is anxious about the slant of his studio light; he is urgent in his inquiries as to what kind of curtain to employ; will follow implicitly the directions laid down in some photographic magazine on the advantage of sidelight, or on the super-necessity of top illumination for artistic effect or 45-degree angle of illumination; how far the subject should be placed from the source of illumination; what height the camera ought to be, what inclination, etc. All this is mechanical, and he ought to know all about it before he puts his model before the camera.

A well-appointed studio; in fact, the most scientifically constructed studio, is after all, only a means to an end in securing artistic effect. A cut-and-dried method of photography is the bane of the profession. There is more originality and a greater display of effective illumination to be found in amateur work, simply because nine times out of ten the amateur is obliged to work under con-

strained conditions of illumination. He has that as a fixed and unalterable quantity, and so his whole attention is upon his model. His thought is on his subject, and the light is made to do his bidding, and the result is generally more pleasing to the artist than the faultless technique and skilled lighting of the professional. The professional cannot understand the reason for this preference of the artist for the crude productions, as he calls them, of the amateur over his carefully but conventionally posed subjects.

Another point, too, in which the amateur is more in line with the artist than is the professional is the employment of models. The only desire of the amateur is the realization of the idea he has in his mind, and the sitter is generally accessory to his striving, and so in a measure contributory.

The artist, as we say, uses professional models. It is true these models, as a class, have not the intelligence of the average sitter to the amateur, but by their experience and training they have acquired a certain amount of pliancy, and are capable of being molded, so to say, to the conception of the artist—in reality becoming a part of the artist's self.

And now the question arises, which is preferable, the model who follows the profession as a means of livelihood, who becomes nothing but the clay in the hand of the artist, and aims to be and to do nothing but what is desired, or the casually selected model, the friend and acquaintance of the photographer, who may be a very intelligent person, capable of high thought and possessed of keen artistic perception, and who may desire intently to carry out the conception demanded by the picture?

Unfortunately, this role of the model's, though apparently a very easy one, is not so easily played as one might imagine.

It is one thing to take a histrionic attitude and to have your soul filled with the theme for the delectation of an audience, and another to pose before the camera so as to give sentiment, life, and animation to the image on the ground glass. The histrionic pose is a dead failure in photographic art. Any artist will tell you it takes certain characteristics to make a model.

The class model or professional model is really a certain social differentiation, and on this account is to be preferred to the haphazard selected model or self-conscious sitter. We frequently hear the remarks of people when pleased with a well-conceived picture, "What a clever model," or something of the kind, implying that the artist was dependent altogether on the model for his success.

Now, nothing is more fatal to success in portraiture or genre than to have a model who is clever or too intelligent. It is more fortunate to have one who, while possessed of these qualities, is at the same time obedient and pliable.

Everyone knows that actors are the worst possible agents in the hands of an intelligent photographer. Dramatic action is appropriate with its proper stage settings, but it is out of place in a photograph—it makes things look stagey. And yet actors, as a class, are far above the artist's model in intelligence and education, but it is just the self-conscious knowledge which makes them spoil the picture. A photographer who has no idea of his own will succeed better with an actor than with an artist's model, the reason being obvious. But when try-

ing to materialize some idea of his own in a picture (?) his model had better be kept in ignorance of his intention. All that is demanded is compliance, and this can only be effectively secured by employment of trained, hired models.

Even the expression of the subject is better secured by the use of the paid model. The photographer is bound to get nothing but a histrionic pose by asking a model to assume a trait not inherent in her character. Even Reynolds did not succeed as well with Mrs Siddons as the "Tragic Muse" as with some of his other works, notably the "Duchess of Devonshire." Any one can see in this delightful composition of the great painter how he has utilized the unconscious moment of the model, when her every thought was centered upon the little child she is holding at arm's length.

But let the photographer be within the moderation of nature and not strive to get agonizing expressions. Never attempt a subject which cannot be followed out with a model. Be natural, and ye shall enter the kingdom of art, even if ye may be cast out of the salon!

Never advertise the method by which you secured your result, neither to the model nor to the readers of art magazines. Be magnanimous, and let the model imagine she is the be-all and the end-all of your success.

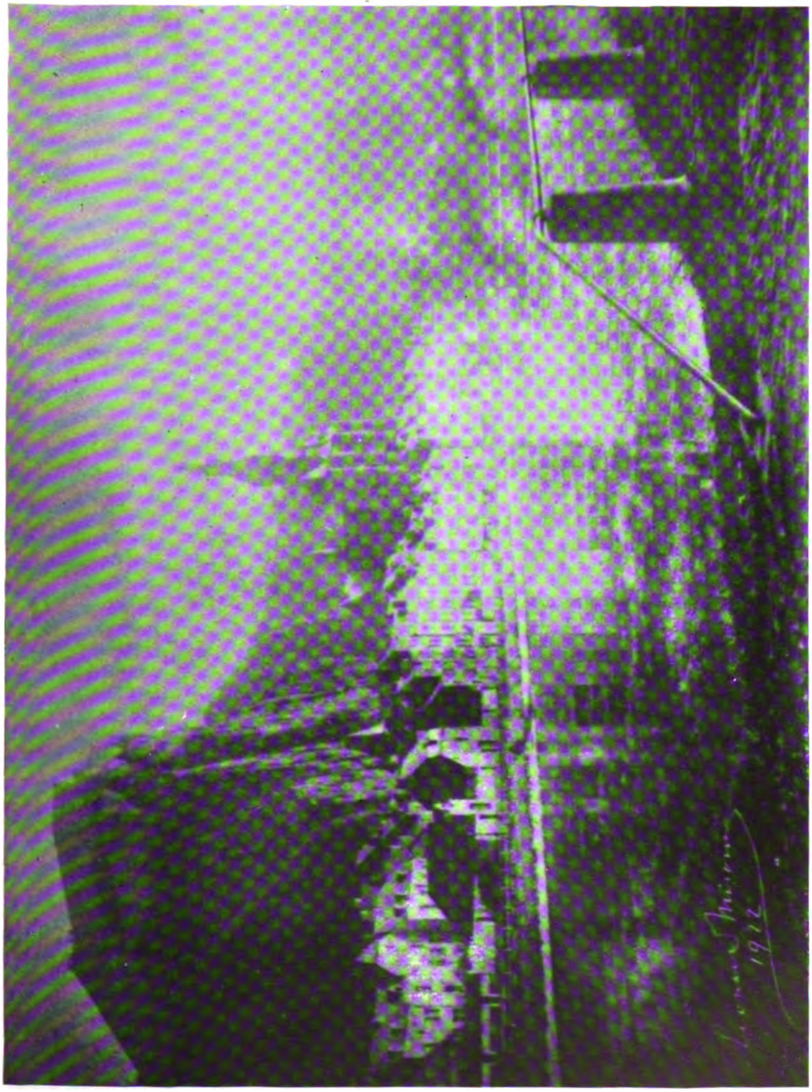
Let us photographers follow in the line of the painters, and not be so ambitious, or, rather more forcibly put, self-conceited by carving out new paths in art for ourselves which the painter fears to tread.

Let us study lighting and posing and draping from the painters' art with the aid of the compliant trained model, a girl who is perfectly at her ease while with the photographer, who knows just how far to appreciate his chaff, and who doesn't take offense easily or get tired or impatient, or knows better than the artist; whose ambition is to please and to be accounted a success at her trade: one who will do anything desired to carry out the artist's idea, about which *per se* she knows nothing and cares less.

Such a subject will be more likely to give the picture success than the young lady of your acquaintance whose every movement you consider a favor, and tell her so; every change a condescension, and from whom you are from time to time supplied with distracting suggestions about the *motif*.

Then the chance of selection is wider amongst the ranks of the Trilbys. There are more comely faces and graceful figures willing to have their charms portrayed, and the photographer is not compelled, as he frequently is when a friend has posed for him and he has achieved something beautiful, to hide his picture and surreptitiously exhibit it to only a few choice friends with fear and trembling lest he offend the fair original.

Therefore, in conclusion, I want to inculcate, first, have a definite idea as to what you intend to embody in your picture, then search out the model or models best suited and go to the lists of the professional rather than to the circle of your friends.



"DINANT" LEONARD MISONNE

From the One Man Show at The Camera Club, New York.

"GIVRE" LEONARD MISONNE

From the One Man Show at The Camera Club, New York.

PHOTOGRAPHY IN THE SERVICE OF THE POLICE

THE term "police" is here used to include all that part of our system of government, local, state and national, which is concerned in the detection and punishment of crime. No doubt officials of this type date back to a remote past, but space need not be taken up with the history thereof. Crime presents itself in two distinct aspects, the sporadic or occasional, and that which has been unfortunately dignified by the term "professional." The methods of dealing with the latter have comparatively little interest for the public, although they constitute the bulk of the work of the police. The public is more interested in the crimes which are committed by those who are not recognized as professional criminals, and especially when the act is one of violence. A vast fiction literature has grown up in connection with the detection of crime of the sporadic type, and the "detective" story has perhaps as great a vogue as the salacious one, and certainly a longer and lasting popularity. The stories of Gaboriau, Poe and Doyle are among the most popular literature of today. Notwithstanding the essential unreality of the methods detailed in these works, they are written in a most interesting manner, and may be enjoyed by those who are familiar with the actual methods and recognize the defects of the tale.

It is obvious that scientific methods should be of great use in the investigation of criminal cases. The chemist has been long a conspicuous figure in such lines. A very large part of the crimes of violence against persons is the administration of poison. A special department of applied chemistry—toxicology—has grown up, and great advances have been made in the development of accurate and delicate methods. The microscope has come into great use along many lines, and the camera has found extended application.

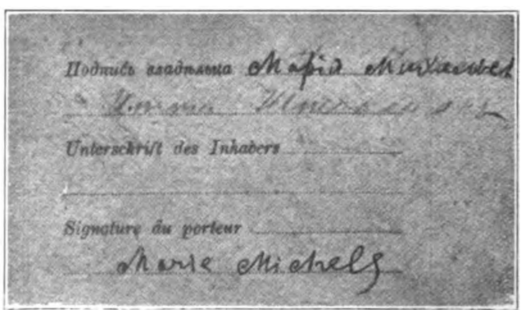
The great value of the camera is that it makes a permanent record. What is seen by the unassisted eye or by magnification is, in many cases, transitory, and very few persons are able to use the instrument with satisfaction, but in the hands of the photographic expert, the field of the microscope may be fixed upon a sensitive surface and not only retained indefinitely, but duplications without limit can be made.

For purposes of identification of individuals, the camera has a wide field of usefulness. To show this we have but to compare the method used now-a-days in issuing passports, and that followed in earlier times. Vague descriptions of complexion, color of hair and eyes, height and other details have given place to a carefully made photograph, so attached that a substitution of another picture is practically impossible. In dealing with professional criminals, the same methods are applied; the "rogues' gallery" is a prominent portion of the equipment of all police headquarters. The recording and magnification of finger prints have become a familiar part of such records. During the late war, it became very important to identify the many workmen and workingwomen engaged in munition factories and other places into which an enemy agent

might seek to enter to do harm or to secure information. Ingenious methods of identifying these employees were devised and extensively used.

The methods of photography are, however, now carried far beyond the mere recording of what is visible to human eye. Fortunately, the ordinary emulsion is sensitive to influences not appreciable to human senses, and thus conditions can be discovered which were impossible of detection in earlier days. Among the principal methods employed to secure these results are the employment of color screens and the use of infra-red and ultra violet light. Color screens serve to accentuate the color contrasts in many cases, and a considerable variety of such screens is now available. It is an interested evidence of the interdependence of the different sciences, that the benefit that is derived from the use of such screens is largely due to investigations along lines entirely apart from photography. The coal-tar colors, as they are commonly and collectively called, are the result of elaborate research, spurred on by the commercial and industrial advantages that they instituted. Incidentally, the qualities of these colors, such as the great range of tint and shade, high coloring power, easy solubility and capacity for staining tissues, have led to their use in several most important lines of research, such as bacteriology and pathology. In addition to the use of the color screen, the staining of tissues emphasizes certain portions and enables a more vivid picture to be taken.

The applications of the camera to the detection of crimes and criminals are so manifold that it is difficult to determine at what point to begin the enumeration. It is true that its work has not met with approval at once. Courts are conservative; the general tendency of the practice of law is to rely on precedent. In damage suits, judges have occasionally refused to allow photographs of locations or injuries to be submitted to the jury, on the ground that the details may be manipulated so as to exaggerate some feature, or produce a false relation. It is true that photographs can be "faked." The production of fake pictures in the field of the supernatural is quite frequent and was discussed in a recent issue of this journal. The service of the camera is not limited to the ordinary form, which gives more or less reduced pictures of the object; the microscope


Unterschrift des Inhabers

Signature du porteur

Marie Michels

ERASURES MADE MORE DISTINCT BY USING COLOR SCREEN.

Courtesy of the American Journal of Pharmacy.

comes into play in a thousand and one ways, and always with the great advantage that for each field a permanent record can be made. The fact that the ordinary emulsions are sensitive to rays of light not appreciable to the human eye widens very much the application of the camera, but this fact requires to be kept in view in interpreting results, or comparisons may be misleading.

The examination of documents has become of great importance in consequence of the enormous increase of business and of litigation arising out of business transactions. Photography has been found to be of great advantage in this line, since, by means of screens and special forms of illumination, differences can be brought out that are not appreciable to the unassisted eye. Handwriting has been from an early use of it the subject of study. Reference is not made here to the so-called "graphology"—the employment of handwriting for determining character. There is doubtless a good deal of dependence of the usual penmanship of a given individual upon temperament, disposition and physical or mental conditions, but the tests that have been applied seem to show that the inferences are approximate only. A radical change has come over the problem in recent years through the invention of the typewriting machines. Letters are now so largely written by professional typists, that the autograph collector of the next generation, who is assembling the written examples of the great men of the present, will find little else than signatures, and in many cases even these will be "per" someone. To the catalogue abbreviations "L. S." and "A. L. S." will have to be added "T. L. S.," standing for "Typewritten Letter Signed."

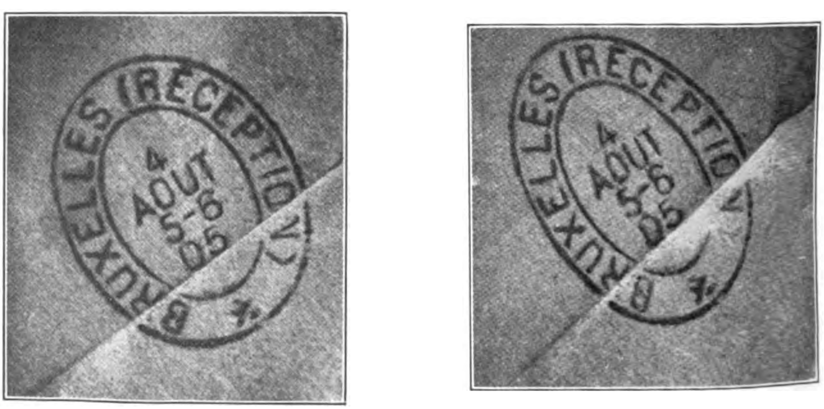
To ordinary examination, that is, to what is called "the man in the street," most typewriting is essentially the same, but distinctions between some widely used forms are recognized without difficulty. Some of the more familiar instruments are sufficiently alike in their letter forms as to be not easy to differentiate without magnification. Only moderate power is required for this purpose. Osborn, in his work on "Questioned Documents," gives photographs of magnifications of the lower case "y," from three well-known machines, which show quite clearly the differences, and which would enable the expert to determine which of the three machines was used.

It has been especially good in the detection of alterations and erasure, especially in checks. Forgeries of signatures to negotiable documents and to wills are common, and much care and ingenuity are often required to elucidate the true condition. In many of these cases the writing constitutes but one point in the examination. The water-mark and the composition of the paper require to be examined. Water-marks have been important data for many years. The oldest so far noted was used about 1300. They were regularly used on most grades of paper, each manufacturer having his own series. In collating the editions of authors of high reputation, the water-marks often come into valuable use. The nature of the paper is also a matter of great moment. This requires the microscope to elucidate, and the work is much facilitated by the use of staining agents. Here photography comes into very valuable application, as it enables a record to be made of what the microscope shows. The first papers

were from linen rags; afterwards cotton was used. About the middle of last century, wood pulp, obtained by chemical processes, became a commercial article, and a pretty good paper-stock was made from it. Of late years, ground wood, obtained by grinding on a wheel, is employed in large proportion in cheap stock, especially those used for newspapers and cheap books. This is mixed with a small amount of real pulp, just enough to hold it together, and the result is a very weak paper, which begins to discolor soon after use and becomes in a year or two so brittle that it cannot be handled without falling to pieces. The problem of preserving our daily papers for the use of students in future years is a very serious one. It is obvious that an examination of the fiber of a paper might show important points in regard to the time at which it was manufactured.

Some interesting and valuable work has been done by using oblique light. This brings out points not seen by direct lighting. Small elevations are shown more vividly because the oblique light intensifies the shadows. Microscopists and astronomers use this method extensively. It has been employed in cases in which one set of lines has been written across another, to determine which was written last. The relation cannot be made out, as a rule, by direct examination, but by oblique it is often quite evident. Similarly, the tampering with envelopes or other sealed packages can be detected much more readily by means of oblique illumination.

Some work has been done by Wood, of Johns Hopkins, in examining erasures and alterations by ultra-violet and infra-red light, but this line of investigation is yet but little developed. The development of methods of transmission of portraits, handwriting and sketches by telegraph and radio will ultimately put in the hands of the authorities the distribution to many distant points the portrait of a fugitive from justice or a sample of handwriting.



POSTMARK ON ENVELOPE WHICH HAS BEEN OPENED AND RE-CLOSED. LEFT-HAND PICTURE UNDER DIRECT LIGHT; RIGHT-HAND UNDER OBLIQUE LIGHT, SHOWING THE ADVANTAGE OF LATTER METHOD.

Courtesy of the American Journal of Pharmacy.

PRACTICAL AND ARTISTIC POSSIBILITIES OF AERO-PHOTOGRAPHY—H. W. VON DUECKER

DURING my student years in Paris I witnessed a scene that impressed me, at the time, as a rather startling experience. I recall vividly how a man, by the name of Maxime Lisbonne, tried to drive a huge truck, using coal oil as motor power, through the avenues of Paris. The cumbersome thing moved along well enough, but the drivers of other vehicles hooted, and the passing pedestrians jeered and laughed at him. This was forty years ago. Today every prosperous farmer, in the United States at least, would be ashamed if he did not own a marketing truck and some sort of a passenger car besides.

No doubt the same evolution from doubt and hesitation to approval will take place in the development of aerial navigation, until one fine day it will be firmly established beyond opposition and skeptical argument. One can safely make such an assertion when one is informed that the aerial import and export trade of Great Britain, by the means of aerial transports, amounted last year to over five million dollars. We, in America, are rather slow in adopting this new medium for trade and passenger transportation. We generally wait until an invention has proved its material practicability beyond any doubt, and then go in for it for all that it is worth. We leave the large bulk of experimenting to others.

For that reason also, aero-photography has as yet made no particular progress in this country. The opportunity for aerial "hikes" is still too scarce, and even the most enthusiastic amateur would hesitate to venture forth on any such expensive and dangerous expeditions. While in Europe, several clubs and associations of aero-photographers have sprung into life, devoting their photographic faculties entirely to the exploitation of this practicable and, as it is claimed, also esthetic new method of picture taking. I do not say new *scientific* method, as its application, if the camera man is once up in the air, is not more scientific than any other branch of photography.

Aero-photography is as good a term as any other for this kind of work. An aero-photograph is really nothing else but a very skilfully and accurately made map or bird's eye view, made with less waste of time and considerably more facility by the means of photography.

It had its sudden start and rapid development during the war. It was used largely for reconnoitring purposes and proved to be a wonderful weapon in the hands of those that made quickest use of it. How far its usefulness really went only staff officers and members of the flying corps could reveal. What was wanted above all else was a detailed image of the utmost clearness and precision, which would stand the closest examination with a magnifying glass. The total effect of the picture was less valued, as it had to serve primarily as information. To get a clear vision of some unknown territory, the lay of the enemy's land, the direction of roads, the topography of the country as to fields, ditches and woods, elevations and possible obstructions—to recognize these in a print clearly

at their true valuation of angles and boundary lines was the main object of military aero-photography. Towards the end of the war, however, many of the practitioners realized its unlimited possibilities for survey and map-making.

Aero-photography could be and will be of particular use for geodetic survey of any description, for the scientific as well as pictorial study of foreign countries, for the supervision of changes of soil formation in mountainous regions, of river beds and lake, and ocean shore lines, and also for more material purposes as real estate information and advertising of various kinds. Its adaptability to survey, no doubt, constitutes its most important feature of usefulness. The average layman, I fear, knows very little about survey except that there are men with portable instruments who can settle disputes about boundary lines of property, who can measure the area of land and who are of particular value in the construction of automobile roads. It is not the purpose of this article to go into an elaborate description of the various activities and applications of triangulation. It must suffice to state that all reliable and standard map- and chart-making is based on a system of precise triangulation. The entire surface of a piece of land under survey is divided into triangles, whose points according to goniometric and trigonometric calculations are determined and marked with stones or poles. The situation of these points on the surface of the earth make topographic investigations possible. They furnish the skeleton construction for maps of any desired scale. Our Coast and Geodetic survey is exceedingly active. A system of triangles has been established along the coast from Maine to the Gulf, including the actual shore line, harbors and inlets. A second chain of triangles is running from North Dakota to Mexico, following the 98th meridian, and still a third one, along the 39th parallel, passes through thirteen states from New Jersey to California, affording cities, smaller municipalities and road-makers an accurate basis for all local survey, and the level of ditches, sidewalks, sewers, watermains and streets.

The resulting records of these valuable informations were hitherto artificially made by ingenious instruments, draftsmen, engravers and printers. The application of aero-photography would greatly simplify the process. A photograph made from an aeroplane from a comparatively high altitude of 600 to 800 feet, the photographic plate in a strictly horizontal position, has really all the semblance of a finished map. The image is reduced to instructive lines and planes and shows sufficient gradation and texture to give us not only an accurate idea of the object, but also of its particular character and significance. Look at Fig. 1, taken by an expert practitioner overseas, the view of an old estate with adjoining farmland. One can clearly see the roads, by-paths, fences, the wooded parts and the division of the fields. One can distinguish houses from empty lots, and trees from bushes. One can even count the trees along the roads. With still more clearness one could judge, whether the fields were cultivated or lying fallow, whether they were newly ploughed or its crops approaching harvest time. More careful rendering of texture would also yield the information of the kind of crops, trees, etc.

Our illustration is a combination of three exposures, which proves that the

experienced aero-photographer has no difficulty in controlling the vertical direction and changing his viewpoints without losing the original altitude. This, however, seems to belong more to the vocation of an aeronaut than a photographer.

The ideal aero-photograph, no doubt, is the result of perpendicular exposure. It has its own optical peculiarities. The image displays just the opposite of what we are used to see. The perspective we are accustomed to annihilates distance and inflates, as it were, all near objects in balloon-like fashion. Our ordinary vision is one of short-sightedness. Objects at a certain distance become unrecognizable, while the foreground reveals itself conspicuously in two dimensions, those of width and height. The depth is lost. The viewpoint of the aero-photograph changes this. The third dimension asserts itself. The centre of the lens floats *above* objects, keeps at a proper distance and is in a way truly objective. Things are not seen one behind the other; on the contrary, next to one another. In perspective views, just as in the images reflected by a mirror, the scene changes as soon as the spectator shifts his viewpoint, no matter how slightly. In perpendicular aero-vision the scene is permanent, as a new viewpoint changes only the boundary lines of the image, not the image itself. The appreciation of height becomes as vague as ordinarily that of distance. The predominance of the vertical line is broken, for the vanishing point in aero photography lies under the surface of the earth. If you draw an imaginary plumb-line from the centre of the lens down to the earth, you get the vanishing point for all perpendicular representation. In diagonal exposure (the photographic plate in a diagonal position towards the earth) the vanishing point is

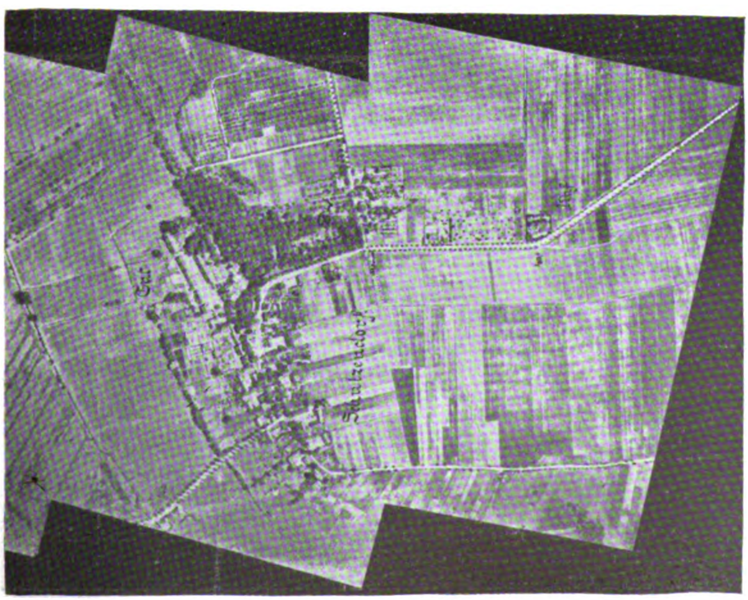


FIG. 1

of more importance, as the vertical lines become clearly visible. In that case the vanishing point changes with every change of angle, but not conspicuously so, as the vertical lines are too short to make occurring inclinations particularly noticeable (viz., Figs. 2 and 3).

The atmospheric conditions, of course, play a part in aero-photography as in all daylight photography. The strata of air immediately over the surface of the earth being thinner than those that occur in the distance, and consequently the light rays traveling from the object to the lens penetrate them with greater ease. This means, provided the atmosphere is clear and a yellow filter used, that the whole picture area is evenly lighted or almost so. Of course, changes of density in the air may produce certain derivations and errors of design towards the margins. Fog and mist are more easily penetrated from above than in a vertical exposure below. The worst enemies of the aero-photographer are rain and clouds—they can be overcome only by patient waiting.

Before we leave the topic of perpendicular exposure, the writer wants to emphasize once more its special usefulness for detailed and exact information in all the various activities of survey. Notably in forestry, for instance, of the extent of forest fires, tree diseases, and damages done by storms. Second, in agriculture, in behalf of state boundaries, irrigation, progress and extent of cultivation, etc. Furthermore, in the interest of safe navigation, of coast and harbor charts and information pertaining to latitude and longitude, of currents, shallow waters, channels, tides and deep sea soundings. And finally, also for all construction work, as railroading, bridge building, the planning of new roads and streets. It is said that eighty per cent of the entire surface of the earth has not yet been properly surveyed. Considering that terrestrial as well as hydro-

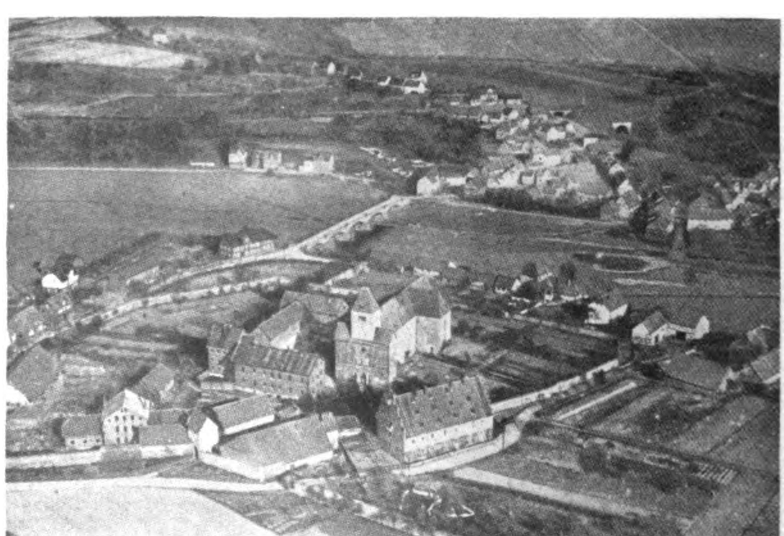


FIG. 2

graphic survey is absolutely necessary for the expansion of traffic and interchange between nations, aero-photography should surely offer a golden chance for entering a new and interesting profession.

Aero-picture making, resulting from diagonal exposure, apparently has also a vast field to conquer. According to the height from which such a photograph is taken, it will be more or less like a bird's eye view. Fig. 2 was taken from an altitude of about seven hundred feet; Fig. 3 from a height of five hundred feet. They surely have pictorial merit, and I do not see that they are so contorted that they could not be appreciated by the layman. No doubt our eyes will be gradually trained to appreciate pictorially, even more extreme renderings. We only have to remember how long it took former generations to digest and endorse the laws of horizontal perspective. For centuries mankind was satisfied, even as the Japanese until very recently, with flat outline representation on the Egyptian order.

But the pictorial merit is not the main point of this kind of photography. Nor do I believe that the diagonal view will ever be of great value in scientific application. There is a stereoscopic method of taking a scene in two diagonal exposures from parallel view points at an equal distance from the object, and of deriving from this combination the material of constructing relief charts that show surfaces plastically instead of flat, and that are more accurate in regard to relative distances. This may be an excellent method, but the real usefulness of the diagonal exposure photograph lies in a different, more practical and, if you like, material domain. The taking of views and beautiful sites will surely be revolutionized in time. Summer resorts and hotels will advertise in that novel fashion. But its principal value will be in the service of industrial enterprises.

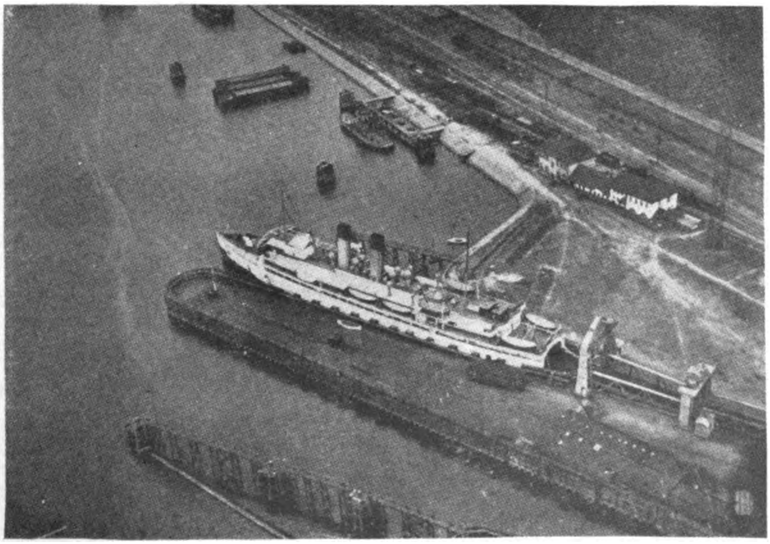


FIG. 3

For instance, if a manufacturing centre, a large plant is the subject of representation. Will not an aero-photograph do more justice to the actual activity in such a place than a series of ordinary photographs? The buildings will not be seen in flat rigidly, but as an entity (enlargements are, of course, easily procurable). Every vehicle, every track, shed or platform, every accumulation of material in heaps or stacks will be plainly visible. The spectator will become conscious of the ground plan and elevation at the same time, and notice the condition of buildings, of the ways of communication and transportation, etc., more easily than otherwise.

The vertical lines of buildings and chimneys, of arches, posts and poles will all show a slight inclination towards the margin, but in exchange, the picture will show less shrinkage in the distances. Besides there are other advantages. Rivers and waterways appear to us no longer as mere strips, but wide open, showing all they contain of water-craft, boat landings, etc. Towns and villages reveal their contents, houses their gardens and court-yards, workshops their out-of-door paraphernalia, and in that way will make the contemplation of the picture, materially at least, more interesting.

Some critic in Europe, after seeing an exhibition of aero-photographs, exclaimed enthusiastically: "Indeed, a marvelous feat! We no longer see the face of our dear Mother Earth as a profile, but as every good portrait, diagonally, from the front—a picturesque three-quarter view!" This may be going a trifle too far. But no doubt we stand face to face of a great innovation —a new expression of form. Aero-photography may eventually change our conventions of art and pictorial representation, for it truly opens up a new world of optical if not esthetic sensations, not an imaginary realm of artificial experiments like cubism, but a vast panorama of realities ready for conquest.

USING BOTH ENDS OF THE SKYLIGHT—FELIX RAYMER

THERE is not the slightest doubt in my mind but there are many operators to whom the idea has never occurred that both ends of this skylight are equally susceptible of good work. It is so easy and natural for one to fall into the habit of using one end that unawares we seat our subject under the east or west end, as the case may be, and never think to try the other.

The advantages of considering the subject's face from both ends of the light are many, and after one has experimented several times he will be surprised to find what a vast improvement can be made in the picture of certain subjects by simply changing them to the other end of the light.

Of course, all operators know by having the subject seated under the west end of the light (this is supposing the light to be a northern exposure) the light falls on the left side of the face; and, of course, to change him to the east end would cause the light to fall on the right side of the face. Now the changing of the light from one side of the face to the other places one of the best weapons

in the hands of the operator for combating hollow cheeks, eyes, crooked mouth, nose and many other defects to which the human face divine is heir. There is an old maxim among operators that "every face must be lighted for itself," and to carry into fulfillment this maxim they prance backward and forward under the light in an aimless way, jerking a curtain here, kicking over a stool there, and then say they have made the lighting on each face differently. As a matter of fact, the only difference possible is to change the light from one side of the face to the other and concentrate it more or less as the face requires.

In the past few years I have had occasion to work under many different lights, and it has been the result of my observation that nine out of ten operators have their subjects seated under the west end of the light. This brings the light on the left side of the face. I have asked several why they preferred having the light fall on the left of the subject, and in most cases the answer was to the effect "they had learned to make it that way from the operator who taught them," and it never occurred to them to change. Others did not know why "except the light seemed to work better from that end." But one *good* operator gave me what I consider a *good* answer, and that was "most men part their hair on the left side of the face, and as I make mostly broad effects of light, and as better likeness can be made of a man where the part of the hair shows, I prefer the light falling on the left side." Good so far as it goes, but when I asked him "what of the ladies?" (somehow I always have a feeling for the ladies and don't want them left out), his answer was "they do not part their hair on either side, and it makes but little or no difference which side the light falls on." The point he made concerning the part in the hair is good, for, as a rule, the character is more strongly marked in the side of the face on which the part of the hair comes, and hence the likeness will be better.

But there are many other matters to consider besides the hair, or its part, and the ladies' faces must be considered as much, if not more, than those of the men.

All operators know (or should know) that every subject has one side of the face that is rounder or fuller than the other. Many operators, to fill out the hollow side and make it appear the same as the other, resort to the use of a head screen and thus flatten the entire lighting, or lower the light so that it falls on the face from a lower point, thinking by this means to fill the hollow cheek. This it does to some extent, but at the expense of roundness to the whole head. A simpler plan would be to move the subject to that end of the studio that will allow the light to fall on the hollow side, thus placing the "full" side on this shadow side, away from the camera, so that it forms the outline. By so doing the light fills the hollow cheek, or so nearly so that it gives the retoucher an opportunity to get in his "modeling ideas" and correct what the operator could not help.

One side of every mouth is lower than the other. This accounts for one side of every face having a pleasanter expression than the other. The side on which the mouth droops has a depressed expression. Place the subject under the end of the light that allows it to fall on the side of the face in which the

mouth turns up; this gives a better expression, owing to the fact that the drooping side of the mouth is hidden in the shadow.

One eye is lower than the other and is smaller. Place the subject so the light falls on the lower eye, and "tilt" his head towards the higher eye. This lowers the higher eye and raises the lower eye, making them appear better balanced. The smaller eye should be placed in the shadow, so as to somewhat hide its form.

The nose turns to one side or the other, due to one nostril being larger than the other. Place the subject so that light falls into the hollow side of the nose, and it serves to straighten it considerably, and the retoucher can do the rest.

One ear is higher and larger than the other. Make a "three-quarter view" of the subject, allowing the light to fall on the best placed and shaped ear.

Some may question this difference in the sides of their subjects' faces. All I have to say is, "Look for yourself." If you can't see the difference, get glasses; if you still can't see the difference, try another business.

Many lights are placed so near the end of the building that they cannot be used from both ends. That is the operator's misfortune. If possible, have the light in the centre of the room, so that it can be used from every direction, and the operator has no reason for not getting *any* effect he may desire.

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Standardized Solutions for Photography

A letter to the edttor of one of the photographic journals asks why a definite developer, adapted to all plates, cannot be formulated. The editor's answer is that each plate requires specific treatment in order to get the results that the maker claims. How far this is true it is impossible to say, for the personal equation enters into the procedure and one person will succeed with a given plate and developer, when another will get unsatisfactory results. Makers cannot be expected to provide materials which will wholly eliminate personal skill and experience, although the modern photographic supplies are of a very high order and only moderate care and skill are needed to get fair results.

It would, however, be a great advantage, if the solutions used in photography could be materially reduced in number. The many formulas for developers, intensifiers, reducers and the other accessory solutions are an expense and trouble to the amateur, and the professional is also not a little bothered. It is true that the organic developers, which for many years were a monopoly of the German factories, have been often brought into active use by shrewd advertising in the same way that many of the synthetic drugs have been forced on the markets of the world, often to the detriment of patients. Among the developers that have been thus introduced, metol and hydrokinone still hold a prominent place, but amidol has lately been a good deal exploited in the French press.

It would be worth while for someone to take up the study of the metol-hydrokinone developer, in relation to all makes and grades of plates and paper. It might be possible to discover formulas adapted to give the best results of each type, and if this could be done, endeavors should be made to get each manufacturer publish the composition of the mixture that will give the best results with his plate. Of course, metol-hydrokinone is merely used here as an example. Studies of other developers could be made with profit. The M-H mixture is, however, so largely in favor that it seems the rational starting point.

A step in standardization that could be made, with comparatively little trouble, is the employment of a uniform system of weights and measures, and the prescribing of the substances in definite form. If solutions are part of the mixture, the strength, in precise terms, should be given. French photographic journals are serious offenders in this respect. Indications by specific gravity or, still more exasperating, by hydrometer degrees, are not uncommon. The confusion in regard to sodium carbonate and sodium sulphite is very annoying. British formulas generally apply to the crystallized forms of these salts; French and American formulas, nearly always to the dry sulphite, and usually to the dry carbonate. The dry forms are those that should be employed. The point is of great moment, for the crystallized sulphite and carbonate contain large amounts of water, and with the carbonate, owing to the readiness with which it loses water, the content in real substance is uncertain. Some advantage has followed the introduction of a sodium monocarbonate, which contains, when in good condition, 85% of true carbonate and is fairly permanent in the air. The dry carbonate is the most concentrated form and it is entirely satisfactory for photographic use. Crystallized sodium sulphite is just half the strength of the dry, and is liable to form a hard cake in the bottle, if not kept very tightly corked. On the other hand, the dry sulphite must be introduced into the dissolving liquid with active stirring or it will "slack," that is, absorb water and form a mass that will be slow in solution.

For proportions of ingredients, the decimal system affords the most convenient method, but as many American and British photographers are quite unfamiliar with this (and will not acquaint themselves with it) it is customary in English-speaking countries to use the old system. Several sources of uncertainty attach to this. The

British gallon is a volume holding ten avoirdupois pounds of water; the American gallon corresponds to only 8.33 pounds, hence the quart and pint are also different in the two countries since they are in each respectively one-fourth and one-eighth of the gallon. For the weights of solid substances, like sources of uncertainty exist. The troy pound and the avoirdupois pound differ materially, and while the latter is the heavier, the weights of the respective ounces are in reverse, as the troy ounce is 480 grains and the avoirdupois ounce 437½. In British formulas, even drams are used (always, of course, spelled, drachm) and recently a formula was given with the minim, a measure of volume that has no place outside of the apothecary shop and might be well abandoned there.

It seems unlikely that any general use of the decimal system will prevail in English-speaking countries for some time, and it is worth while to inquire if some substitute for it may not be offered, by which the confusion and uncertainty of the old measures will be avoided. It may be possible to camouflage the metric system, so to speak, that is, to present in such form that some of its merits may be secured and yet the user not feel that he is being led into the adoption of the system. A plan for such purpose is to use "parts," which may be understood to be essentially "parts by weight." Those who make up formulas owe it to the users to determine, with fair accuracy, the proportions required, although it is probable that most photographic solutions can be allowed a rather wide range of composition. The difficulty in employing "parts by weight" in making up solutions is that it would be very inconvenient to weigh the water, and the calculation from the volume to the weight is troublesome, and, indeed, impossible to many persons. One of the advantages of the decimal system is the simple arithmetical relation between the volume of water and its weight; 1 cubic centimeter having a weight of 1 gram.

A useful reform in the methods of photographers and writers on photography would be to adopt and follow the modern system of chemical nomenclature for mineral substances. One will see, in the course of a short time in the current journals, such expressions as "soda carbonate," "carbonate of soda," or "carbonate of sodium." The proper name is "sodium carbonate," and this should be always understood as referring to the dry substance. If the crystallized (hydrated) salt is directed, the qualifying adjective "monohydrated" or "decahydrated" should be added. Photographers generally should protest against the practice of indicating chemicals by names intelligible only to dealers. This practice may not be so objectionable in regard to a specific manufacture, such as metol or amidol, the systematic names of which are long and awkward, but the employment some years ago by a well-known French firm of such terms as "metoquinone," and "quinomet" was unjustifiable, for the products were not new.

At the present day so many research workers in photographic procedure are trained chemists, and the principles of chemical nomenclature as applied to familiar compounds are so well established, that there is no excuse for such terms as "soda carbonate" or "red prussiate of potash." It is no more troublesome and expensive to be accurate and precise than to be the reverse.

Some Chemical Facts About P. O. P.

Sensitive photographic papers, employed in printing out directly from the negative, differ structurally from papers which are subject to development.

P. O. P., as it is called, contains, besides the silver chloride, a certain amount of free silver nitrate, which is essential to proper printing, inasmuch as the silver chloride alone under action of direct light would not give an image dark enough. This free silver nitrate plays the part of a chemical sensitizer, absorbing the chlorine from the silver chloride, liberated during the action of light.

Now if this explanation is correct, then the sensitive film must contain less silver nitrate in the parts subject to exposure than in the parts not exposed. Let us see if there are any phenomena to substantiate this reaction.

If a glass plate be coated with a solution of gelatine, to which is added some gallic acid, and after the film is set, we lay a picture slightly printed out on P. O. P., it is found to slowly develop up to full strength. If the picture be removed, a negative impression will be seen on the gallic-acid-gelatine film.

In the unexposed and but slightly exposed parts, the silver nitrate has passed from the picture into the film and has been there reduced by the gallic acid present. This

implies, therefore, that under the fully exposed parts of the picture there had been no diffusion of silver nitrate, for little or none is found. A similar appearance is produced if a printed out picture on silver chloride be placed face down upon a film of gelatine containing some sodium chloride (common salt); we get a negative picture in silver chloride. Or further, if an exposed gelatine-chloride plate is placed in a platinum toning bath, to which some common salt is added, the film, in the slightly exposed parts or the parts not at all affected, becomes covered over with a deposit of silver chloride, while no deposit is seen on the dark parts. The deposit is only superficial. A similar deposit is seen in the unexposed parts of a silver chloride print when not thoroughly washed before toning in the gold bath.

In the days of albumen printing (a P. O. P. process), the photographer would sometimes find that an unfixed print (silver chloride), which had been made a considerable time, showed up a dark image on the back, proving that in the dark there had been a reaction set up between the free silver nitrate present and the organic fibre of the paper itself. In this way the appearance of a well-defined negative on the back of the paper was visible.

This phenomenon may be explained in the same way as the others mentioned. The coloration had not appeared on the parts of the back, corresponding to the dark parts of the picture, while it was deep behind the light parts. The silver nitrate settled into the paper support, and as this had not taken place in the well-exposed parts of the film the coloration did not show up on the corresponding parts of the back of the paper.

The Relativity of the Alkalies Used in Development

In the composition of the alkaline developer, there are two principal agents, the reducer and the accelerator.

Pyrogallic acid, or as it is called, pyro, may stand as the prototype of reducers, of which the organic synthetic chemists have furnished many agents analagous—metol, glycine, etc. The accelerating agents are the ordinary alkalies, sodium, potassium, ammonium.

From inspection of the numerous formulæ presented, there seems to be a predeliction for the potassium salt, but the scarcity and advanced price of potassium, incident upon the great war, forced the photographer to turn to the other alkalies.

Ammonium has found but few advocates in America. Although it has decided virtues of its own and is comparatively cheap, since the quantity necessarily is small compared with the quantities of the other alkalies, it has met with objection on account of tendency to cause fog in slight excess.

The question is reasonably asked, "which of the alkalies is preferable?" because their behavior is by no means identical. The formulæ makers, in their recommendations of some particular combination, are not always explicit, indeed sometimes aggravating, inasmuch as they say "potash or soda" indicating the same amount as if it were a mere matter of personal choice. Whereas it makes considerable difference. Then, too, they often neglect to say whether the alkali is crystalline or granular (dry).

The crystals contain what is called mother water, while the granular form of the salt is anhydrous, or without this water, so you must see one is concentrated, the other dilute. The anhydrous variety, however, is always greedy for water it has been deprived of and will take it up from the atmosphere and so weaken. The caustic alkalies of both sodium and potassium absorb carbonic oxide and are so converted into corresponding carbonates. In examining the action of the various alkalies with the reducing agents of the developer, we note a particular marked difference. In the case of pyro, for instance, we find that the difference in result is not materially marked, whether equivalent quantities of potassium or sodium is used. The potassium may be a trifle more energetic but if we substitute caustic alkali, we must look out for fog.

On the other hand, hydrochinone works well with caustic alkali and, besides, it makes some difference from the choice of potassium or sodium.

If we take equivalent quantities of sodium and potassium carbonate and note their respective action with hydrochinone, we find that with potash the development begins sooner than with use of sodium and progresses slower, hence you see power of control in the development.

With amidol, note how small a quantity of alkali is needed to set development in action. Sodium sulphate being sufficient.

One point should be remembered in using the different alkalies. Caustic alkalies repre-

sent developing power in the unchecked form, while the carbonates are really agents having associated a restraining agent, namely, the liberated carbonic oxide. If we take equivalent portions of caustic soda and anhydrous sodium carbonate, and saturate each with sulphuric acid, the same quantity of sulphuric acid will neutralize one part of caustic soda (hydrate) or 265 parts of the carbonate, forming in each case the same amount of sodium sulphate; but in the first case a molecule of water, while in the second a molecule of carbonic oxide.

If now instead of applying the alkaline equivalents of the two, for the formation of the salt, we apply it to our development, we have in the one case untrammeled action of a definite quantity of hydrate, and in the other case a restrainer in the carbonic acid.

This is the reason why bicarbonates cannot be used in development.

Enlarged Negatives by Reversal

Negatives made direct by chemical reversal save one step in the making of enlarged negatives. From the small negative we throw up an enlarged positive, develop very fully right through to the back, using acid diamidophenol developer. Wash out the developer with acetic acid and water and place in a solution of potassium bichromate 1.5 grams, sulphuric acid 15 grams, water 190 cubic centimeters. Rinse, then use sodium sulphite solution for 15 minutes, wash and redevelop. The black silver image first produced dissolves in the bleaching bath, the undeveloped silver being untouched. The second development blackens this undeveloped silver, producing a negative image.

Another reversing solution is copper sulphate, 9 grams, sodium chloride, 22 grains, water, 150 cubic centimeters. Sodium bisulphite dissolves the image but does not touch the silver salts. Wash the plate and redevelop. After bleaching and dissolving away the original negative image, it is, of course, necessary to fog the remaining silver before the redeveloping solution is used.

Such negatives are optically reversed, that is to say, the image looked at through the glass side faces the opposite way as compared with the original small negative. To obviate this, the small negative can, of course, be placed in the enlarging carrier backwards instead of in the usual way.

These negatives are useful for carbon printing or for photo-mechanical work in which they save a transfer process or the use of a prism. A positive made by contact can also be turned into a reversed negative by the same process.—*Harrington's Photographic Journal.*

Theory of Development by A. H. Nietz, being No. 2 of a series of monographs issued from the Research Laboratory of the Eastman Kodak Co., 190 pages; cloth, $2.50.

This monograph on development is not intended for practical photographers, whose interest in the subject is naturally confined to practical manipulation, and hence no working formulas are discussed; development being treated purely as a scientific feature.

The results of diligent investigation are presented to determine the reduction potentials of organic developers, whereby to establish connection between these potentials and the developing characteristics of various compounds by photographic methods, electrometric methods being reserved for further publication in the series of monographs issued by the Research Laboratory.

Valuable data have been made use of and whatever other information applicable relative to the topic; it is purely scientific in the discussion and most comprehensive, and therefore of much value to readers who are interested in those scientific problems, which study ultimately results in presentation of formula and processes which ultimately are of practical value to the working photographer.

"Making Your Camera Pay," Frederick C. Davis, 96 *pages; cloth,* $1.00. *Robert McBride & Co., New York.*

There is always a demand for good photographs for the purpose of illustration and publishers are solicitous in securing pictures of a character meeting their requirements. There are many enterprising photographers, too, who are anxious to find a market for their work, but many fail because they are ignorant of the character of photographic pictures which find a ready market. Information is therefore pertinent to such and this information is given in this little book in regard to making the camera a profitable investment.

The author is a practical and a well-known writer on photographic topics. He gives helpful information as to the kind of pictures and also to their disposal in business.

Proceedings of the Technical Photographic and Microscopical Society

On account of the proximity of the original date of meeting to Thanksgiving Day the usual monthly gathering of the American Section of the Society of Chemical Industry, to be held at Rumford Hall in the Chemists' Club, 52 East 41st street, New York, has been postponed from Friday, December 1, to Friday, December 15. The evening will be devoted to papers dealing with some of the chemical or physical aspects of photographic science, with special reference to the uses of photography and motion pictures in the industries. A paper dealing with the last-named aspect—the application of photography and motion pictures to industry—by Dr. A. B. Hitchins, Director of the Research Laboratory of the Ansco Company, Binghamton, N. Y., will open the proceedings, and this will be followed by an address on "Some Chemical Aspects of Photographic Science," by Dr. F. F. Renwick, Director of the Redpath Laboratory of E. I. du Pont de Nemours & Company, Parlin, N. J. The third paper will be by Dr. Herbert E. Ives, Research Engineer of the Western Electric Company, New York, who is to take for his subject "Color Measurement as Utilized in Color Photography." This paper will be illustrated by lantern slides.

The members of the Technical Photographic and Microscopical Society are invited to attend this meeting, which has been planned for their benefit as well as for the members of the American Section of the Society of Chemical Industry, and it is hoped that the attendance will be a large and representative one.

At the business meeting of the Technical Photographic and Microscopical Society held in the Grand Central Palace, New York, on Thursday, September 14, at 2 o'clock P. M., President McDowell occupied the chair. After greeting the assembled members, he called for the report of the secretary-treasurer, which was submitted by Mr. Keenan as follows:

Report of the Secretary-Treasurer

The idea of bringing together in one organization the numerous workers in photomicrography and photography was conceived originally by our vice-president, Mr. John H. Graff, who called a meeting of those interested during the annual convention of the American Paper and Pulp Association at the Waldorf-Astoria Hotel, New York, on April 10, 1922. This meeting was attended by representatives of some twenty firms who organized, to the extent of selecting a temporary chairman and secretary, John H. Graff and Thomas J. Keenan being chosen to fill the respective positions.

The second meeting for the purpose of more fully organizing and determining the plan and scope of the organization was held at the Chemists' Club, New York, a month later. At this meeting the name definitely chosen for the society is that by which it is now known and officers were elected as follows:

President—James McDowell, Sharp & Hamilton Manufacturing Company, 99 Chauncy Street, Boston, Mass.

Vice-Presidents—John H. Graff, Brown Company, Berlin, N. H.; Bennett Grotta, Atlas Powder Company, Tamaqua, Pa.

Secretary-Treasurer—Thomas J. Keenan, Editor of *Paper*, 36 West Forty-Fourth Street, New York.

An active committee on Membership and Publicity was chosen, with A. E. Buchanan, assistant editor of *Chemical and Metallurgical Engineering*, as chairman, and plans were made for a luncheon meeting at the Hotel Astor, New York, on Wednesday, June 14. This meeting duly took place and was attended by upwards of fifty technical and industrial photographers connected with the various industries; a constitution and by-laws was adopted and committees were named to provide a meeting and exhibition in connection with the Eighth National Exposition of Chemical Industries during the week of September 11 to 16, 1922.

A printed account of the proceedings of the luncheon meeting held on June 14 was mailed to all members and to a large number of prospective members, and this resulted in a good many additions to the membership since it was advertised in the report of the meeting that the society had taken action authorizing the secretary to admit to membership, without payment of initiation fee or other formality, all persons interested in technical photography and microscopy who might make application between June and September, and pay the annual membership of $5.

A special meeting of officers and chairmen of committees of the society was held at the Chemists' Club, New York, on August 31 for the purpose of forming an Administra-

tive Council for the guidance of the society during the interval before the general meeting of September 14, and for the discussion of arrangements and details of the program. A Nominating Committee was appointed by the chairman, Vice President Bennett Grotta, who presided in the absence of President McDowell. It was recognized that the September 14th meeting, being the regular fall meeting, would begin a new fiscal year, which would necessitate the naming of a full board of officers, including an executive committee to serve during the ensuing year, and names of the nominees will accordingly be presented at this meeting.

The following members were chosen to serve as an Administrative Council:

E. R. Morton, Fairchild Aerial Camera Corporation, 136 West Fifty-second Street, New York, chairman; C. W. Gibbs, Victor Animatograph Company, 132 West Forty-second Street, New York; J. A. Lucas, manager photo laboratory, McGraw-Hill Company, Tenth Avenue and Thirty-sixth Street, New York; Thomas J. Keenan, editor of *Paper*, 36 West Forty-Fourth Street, New York; D. S. Mungillo, Craftsman Film Laboratories, 251 West Nineteenth Street, New York; J. A. Scheick, Bausch & Lomb Optical Company, 200 Fifth Avenue, New York; D. G. Woolf, associate editor of *Textile World*, 334 Fourth Avenue, New York.

As a Committee on Nominations, Chairman Grotta named the following members:

M. W. Cohen, Leather & Textile Products Company, 693 Broadway, New York; A. E. Buchanan, assistant editor, *Chemical and Metallurgical Engineering*, Tenth Avenue and Thirty-sixth Street, New York; P. F. Wehmer, Electrical Testing Laboratories, East End Avenue and Eightieth Street, New York.

At the invitation of Chairman Grotta, Prof. E. M. Chamot, of the Chemical Department of Cornell University, addressed the meeting on some of the problems confronting the society, of which he is an active member. Your secretary is indebted to Mr. Buchanan's report of the meeting in the September 6th issue of *Chemical and Metallurgical Engineering* for the following account of Professor Chamot's talk:

"The speaker mentioned the need for specially designed instruments for industrial microscopical work. The needs of the biologist and bacteriologist do not coincide with those of the industrial microscopist, he said, yet the design of standard equipment is entirely dominated by the demands of the former, because it is a well-established demand. By the concerted efforts of industrial workers, it may be possible to convince instrument makers that there is a field for special apparatus that is worth their attention and thus eliminate the necessity of giving this business to foreign instrument makers."

Dr. Chamot expressed the hope that the Society would be able to combat the misguided secrecy that surrounds so many industrial establishments. The war, he said, did much to break down this traditional attitude of mysticism that some firms assume, with the idea of keeping their professional secrets from competitors. The technical societies could do a great deal to show proponents of this obsolete idea what a short-sighted policy it really was and how much better work would be done by the employees, if a company would encourage their mixing with their co-workers from other organizations and freely interchanging ideas.

The Administrative Council and Nominating Committee have held several meetings since their formation and the results of their work will be shown in their respective reports.

The progress of the society since its formation has been marked by a large accession of members and considerable activity, as may be perceived by reference to the printed program or prospectus which gives a list of the members admitted to September 7, 1922, numbering eighty-eight active members and two corporate members, ninety in all. By accessions since the publication of the program the society now has 100 members enrolled in its membership list.

It is gratifying to report that the finances of the Society are in a satisfactory state, as may be judged by the following account of receipts and disbursements from May to September, 1922:

Receipts:		
May	$100.00	
June	213.00	
July	130.00	
August	115.00	
		$558.00
Disbursements:		
May	$30.44	
June	172.34	
July	32.08	
August	37.97	
		$272.83
Balance on hand August 31, 1922		$285.17

It should be explained that the income reported for June included $98, paid for seats at the luncheon meeting, while the expenditures for that month were swelled by the payment to the Hotel Astor management of $116, representing the cost of the luncheon. Included in the expenditures are also bills paid for printing and stationery during that month which were heavier than usual.

Respectfully submitted,
THOMAS J. KEENAN,
Secretary-Treasurer.

Various committee reports were called for. Mr. Morton reported for the Administrative Council, giving some details of the work transacted by the council since its formation on August 31. President McDowell then appointed an auditing committee to examine the books of the secretary-treasurer. On this committee he named J. A. Lucas, Russell T. Fisher and E. R. Morton. The committee reported later that the books were in good order.

The report of the Nominating Committee was then called for and Chairman Cohen presented the following list of officers for election to serve one year:

President—Prof. E. M. Chamot, Department of Chemistry, Cornell University, Ithaca, N. Y.,

First Vice President—Bennett Grotta, Atlas Powder Company, Tamaqua, Pa.

Second Vice President—J. A. Lucas, manager of photo laboratory, McGraw-Hill Company, Tenth Avenue and Thirty-sixth Street, New York.

Third Vice President—C. E. Kenneth Mees, Eastman Kodak Company, Rochester, N. Y.

Secretary-Treasurer—Thomas J. Keenan, Editor of *Paper*, 36 W. 44th Street, New York.

Members of the executive committee to serve with the foregoing officers are F. F. Renwick, Redpath Laboratory, E. I. du Pont de Nemours & Company, Parlin, N. J., and Henry Green, Research Laboratory, New Jersey Zinc Company, Palmerton, Pa.

President McDowell asked if there were any other nominations and none being offered, a motion was made to elect the ticket as a whole. The secretary was accordingly instructed to cast one affirmative ballot for the officers nominated, which he did. President McDowell thereupon declared the officers nominated to be duly elected. He then asked Professor Chamot to take the chair. Before adjourning, on a motion by A. E. Buchanan, a rising vote of thanks was given to the secretary for his work in connection with the organization of the society.

After the adjournment of the business meeting, the scientific program was taken up in another room, where a motion picture apparatus was available for illustrative purposes.

The following program was then carried out:

"Photomicrography in Pulp and Paper Research Problems." by Eloise Gerry, Ph.D., and E. M. Diemer, Ph.D., of the Forest Products Laboratory, Madison, Wis.

"The Photomicroscopy of Paint and Rubber Pigments." By Henry Green, of the New Jersey Zinc Company, Palmerton, Pa.

"How Motion Picture Films are Finished." By S. Mungillo, Craftsmen Film Laboratories, New York.

"The Motion Picture as an Aid to Industry." By Alfred B. Hitchins, Ph.D., F. C. S., director of the Ansco Research Laboratory, Ansco Company, Binghamton, N. Y.

"Pictorial Presentation of the Principles of Radio-telephony and the Operation of the Audion." By John Mills, assistant personal manager, Western Electric Company, author of "Realities of Modern Science" and "Within the Atom."

"Mechanical Improvements in Motion Picture Work." By Clarence W. Gibbs, of the Victor Animatograph Company, New York.

"Thirsty Cotton." By Thayer Francis, of the Parks-Cramer Company, Boston, Mass.

"Microscopy in Leather Tanning." By Guido E. Daub, A. F. Gallum Sons Company, Milwaukee, Wis.

"Use of the Microscope in the Textile School." By Albert H. Grimshaw, Textile School, New Bedford, Mass.

"Protozoa and Rotifers Studies in Microscopic Animal Life." By Philip O. Gravelle.

The Camera Club Exhibits

The Camera Club, New York, will give a members' show, on invitation, at the American Museum of Natural History, Seventy-seventh Street and Central Park, West, New York, from December 1, 1922, which may continue for two or three months. This is the first display of pictorial photography ever held at this great institution. All processes will be exemplified.

Photographing a Window Display

Every good window display should be photographed. A scrapbook of such pictures will show you at a glance the ideas you have already used, and they'll give you new ideas around which to build future window displays. The success or drawing power of the displays can be indicated. A study of the good ones may present some common characteristics that can be used in future displays to advantage, or the displays that proved to be unattractive may show some common faults that can then be avoided.

The best time to photograph a display window is late at night, when the only reflections on the glass are from street lamps or from lights in the stores across the street. These reflections may be prevented by improvised screens placed behind or beside the camera.

Pedestrians passing between camera and window are not recorded on the film unless they stop, because a window that is well lighted with Mazda lamps usually requires an exposure of twenty to thirty minutes.

The camera should be placed at such a height that it need not be tilted. Then there will be no distortion of such parallel lines as door casings and window corners. For the same reason, a wide angle lens should never be used. In such work the most suitable lens is one whose focal length equals the diagonal of the negative. Unless the lamps within the window are concealed, a lens hood should be used to prevent reflections on the lens.

The length of exposure depends on the volume and actinic quality of the light used in the window. If there is an average amount of light from Mazda lamps, twenty or thirty minutes exposure on commercial ortho film with the lens at *f*16 is usually sufficient. If nitrogen-filled lamps are used, the exposure may be much shorter.

By keeping a record of exposures and conditions under which they are made, you will be able to judge accurately the exposure needed.

If the window contains a combination of colors, it is advisable to work with panchromatic film and a K1 or K2 filter to insure correct rendering of the colors. But if Mazda lamps are used, it is unnecessary to have a filter because their light is yellow enough to produce on panchromatic film the same result as when a pale yellow filter is used with daylight.—*Photo Poster.*

Enameling Platinum Prints

Sometimes the gloss on a paper print has been produced as a protective coating and for giving great transparency to every part of the picture, particularly the shadows. The protective coating is, in some cases, a very substantial one, because it consists of a material that is not acted upon by the changes in the atmosphere, nor by changes in temperature. A semi-gloss is readily obtained, the coating being one that is thoroughly protective. This coating is brought about by simply coating a mounted photograph with a thick amylacetate collodion, allowing the coating to dry spontaneously.

Most photographs treated in this way present a greased and spoiled appearance, when coated and before drying. When dry, no mark whatever is to be seen. When the lacquer becomes dry, a beautiful even surface is produced, waterproof and semi-gloss in appearance.

To enamel a platinum print, this method of coating will not answer. The following method, which is very much after the process of enameling albumen prints, is the one best suited. The prints to be enameled must be coated, in the first place, with a strong solution of gelatine, made up as follows:

Hard gelatine (Heinrich's)......... 1 oz.
Water ....10 ozs.

Allow this to soak for half an hour, and then melt the gelatine by placing the vessel into hot water. As soon as the melting is complete, add 15 grains of chrome alum in 1 ounce of boiling water, then add this to the hot gelatine, few drops at a time, stirring vigorously. If the mixture has a tendency to thicken, add a very small quantity of acetic acid, stirring well, when the gelatine mixture will thin down again. Strain this mixture through a fourfold thickness of cheese-cloth into a porcelain or white enameled tray, made warm previously by filling it with hot water, then draining it before pouring the gelatine solution into it. A print may now be taken and lowered carefully on the warm gelatine, allowing it to remain for 2 minutes, or, perhaps, a little less. The print is then lifted and suspended by one corner to drain and dry.

The gelatine solution need only be just warm, because, if it is too hot, there will be only a very thin coating left upon the print. A number of prints may be treated in this way, and dried. The object of this

preliminary coating of gelatine is to fill the pores of the paper, as well as to give it a perfectly adhesive surface.

The next operation will be to have ready a number of clean glass plates a little larger than the print. These plates must be cleaned with a small quantity of talcum powder, sometimes called powdered soapstone, and well polished. The plates must be coated with a film of plain collodion by pouring a pool upon the center of the plate, then tilting it so that the plate is covered to the four corners, and tilted again so as to pour the excess into the bottle it was poured from, moving the plate to and fro on one corner so as to prevent straight or crapy lines forming. The plate may then be waved in the air to secure complete setting of the film. Just as soon as this takes place, the plate must be inserted in a tray of clean cold water and allowed to remain until all apparent greasiness has disappeared, which means that the alcohol and ether have been washed out of the film.

A number of plates may be prepared in this way. One of the platinum prints may now be taken and placed in cold water to soak for a few minutes. Meantime, the gelatine solution, the same as used to coat the prints with, must be melted and poured evenly over the surface of the wet collodionized plate, and slightly drained. Now, lay this plate back down upon a level board. Place the wetted print into warm water, and as soon as the surface feels slimy, remove it and place it, face down, upon the collodionized plate. Place on this a piece of India rubber sheeting, hold one end down firmly with one hand, then apply the squeegee from the center outward, gradually increasing the pressure. Upon turning over the print, it will be seen that the print possesses at least three times the brilliancy it did before being treated. Allow these plates, with the prints attached, to dry spontaneously, which will require from 10 to 12 hours, then place a straight edge within one-eighth of an inch of the outer edge and make a clean cut with the tip of a sharp penknife all around. Then lift one corner by inserting the tip of the penknife, when the print can be easily pulled off. It will then be found to possess a fine enameled surface, with detail shown in the shadows that was not apparent when the print was in a matt condition.

The mounting of these prints must be done with a clear solution of thick gelatine, applied in a light streak of not more than one-eighth inch wide upon the back, having a small space between this cement and the outer edge of the print. To take up the excess of gelatine, when the print is put under pressure, which must remain so until it is quite dry, the addition of a small quantity of acetic acid to the mounting gelatine will aid the fluidity and keep it in a semi-liquid condition when not in use. The gelatine that forms the covering for the print and the coating of the collodionized plate may have a few drops of carbolic acid added to prevent fermentation setting in and the formation of mould growth that would completely spoil the gelatine. The collodion coating forms a reliable protection against moisture and marks caused by handling.

Focusing

A considerable portion of our photographic literature is now devoted to attempted explanations of various manipulations which can only be mastered by practice, and some of which can only be learned by seeing another person perform them.

A writer who sets himself to the work of giving directions how to perform these manual operations assumes a difficult task, and let me here say that I shall only try to give an idea of the principles upon which good focusing depends, and which are unconsciously put into practice by every skillful operator. I shall not attempt to say just how it is done.

I will suppose that a person has made fair successes in his first efforts, and not done so well afterwards; sometimes, perhaps, failing entirely on subjects rather near at hand, yet presenting successive reaches of distance, all of which must be rendered equally sharp. Or, again, that after making good instantaneous views at the seashore with the definition sharp at the very edges of the plate, he finds it impossible to take groups of people and obtain the features of all equally distinct. Desiring to ascertain the causes of his failures and to become expert in focusing, he should proceed somewhat as follows: Having selected a subject lying in one plane, like the wall of any large building, the camera is to be set up, say, two or three hundred feet away from it, and then the lens focused sharply on the center-spot of the ground glass, the stops being removed. In order to focus with ease and accuracy, the operator should *sit*, not stand, and the camera may be lowered until the ground glass is at the level of the eye. The

focusing-cloth should be of black velveteen, not less than a yard square, so that the head and the ground glass may be perfectly covered and leave enough underneath to fold up under the chin, and prevent light from the ground from getting in and confusing the eyes. There must be no constriction around the neck; there is no greater impediment to good focusing than a tight collar or neckband.

The camera image being now examined, it will at once be seen that while the bricks in the wall that are upon or near the center-spot are perfectly sharp, the area of this sharp definition is very limited, and that toward the edges of the plate everything is fuzzed and indistinct. But if a point about midway between the center and the edges be focused upon, the image will then look worse than before, the center or principal parts being entirely out of focus, and the edges little, if any, better. By now inserting a small stop and exposing a plate with both of these methods of focusing, it will be found that the latter one is superior in every way, bad as it looked to the eye. Its center is sharp enough, as are also the margins; while the between portions upon which the focus has been taken are, of course, perfect. The reason for this depends upon the fact that for all subjects as lie in one plane (or nearly so) at the distance of infinity, the absolute center of the field is too far distant from the lens to serve as a proper focal point. Or, to put it in other words, when the center of the picture has been sharply focused and the stop afterwards inserted, the ground glass may be pushed in considerably nearer the lens with much benefit to the marginal portions of the image and no loss to the center. The angle at which the rays of light forming the image converge when a small stop is used is very acute—indeed, approximating to a straight line. The ground glass, then, may travel to and fro for some little distance along this line without interfering with crisp definition.

But it is very important not to forget that the crispest and best definition of any lens is not to be found upon any plane surface (such as the ground glass or the sensitive glass), but upon a hollow sphere. As it is impossible to make this clear without numerous figures, I prefer to recommend some of the well-known treatises on photographic optics for a fuller explanation. It is sufficient to bear in mind that focusing on plane surfaces is more or less of a compromise. Years ago attempts were made to substitute curved or spherical plates for photographic purposes on the plea that the definition of the lens would then be perfect. It is hardly necessary to say that such efforts were soon abandoned. That form of panoramic camera known as Moessard's cylindrograph could not be quoted in this connection, for, although the sensitive film is curved to fully a half circle, it is only the *central portions* of the lens-field that are utilized; each section of the plate in turn being impressed by these central portions, which are forced to pass through a narrow slit excluding all other light.

Where comparatively slow-working lenses have to be used with large stops, as in instantaneous work upon badly lighted subjects, skill in focusing will be very desirable. The best general rule to give is this: focus sharply upon the principal object or objects with the *face opening* of the lens, then insert the stop to be used, and again examine to see how the other parts of the picture behave. Supposing we were photographing a naval review on a dark, drizzling day, and that we knew very nearly where the vessels were to pass. We would send out a boat to the place in question and focus upon it with the full aperture of the lens. Then stopping down the lens, we would examine the margins of the picture so as to see whether such vessels as had passed the center or not yet reached it would be sharp enough on the ground glass with the stop used. If these were found not to be the case, we would send the boat to the right or left in the direct line of the review, so as to bring it about midway between the center and the edges of the picture, and focus again, which would probably give the requisite distribution of sharpness. Observe that all our efforts in this case would be directed towards obtaining passable definition upon a narrow strip of the subject lying at right angles to the camera. The extreme distance and the near foreground would thus have to be neglected entirely, and if the foreground were found to be crowded with objects much out of focus, the only resource would be to trim them out of the picture. The absolute center as well as the extreme margins of the picture might thus be a little wanting in crispness, but the general effect would be far better than if the focus had been sharply drawn upon the center; for in this case the margins would be so much out as to necessitate trimming the pictures to a smaller size.

Portraiture offers troublesome problems in focusing. The general rule given is to focus upon the features of the sitter. Now, of course, the features must be sharp, but in order not to create too violent a contrast between them and other portions of the picture it will be found that this plan of *distributing* the definition gives very good results. If the full standing or sitting figure is to be photographed, the head will be far from the center of the plate, and probably the upper buttons of the vest would be a good spot for the principal focus. The fact that portrait subjects are within the distance of infinity, *i. e.*, that point beyond which everything is sharp in the case of landscape lenses, makes focusing more troublesome. Large heads nearly or quite filling the plate are difficult; the profile is probably the least so, as it approximates more nearly to a plane. While full-face or three-quarter positions will tax the powers of any lens, the best plan to follow is to select a lens with great "reach" or depth, and of long enough focus to give a large enough image while keeping well away from the sitter. Good results may then be obtained by focusing, say, on either temple and stopping down afterwards, while a short-focus lens brought to within a few feet of the sitter could never be made to give the necessary "depth," even if stopped down.

Groups of people are easily brought into good focus by bringing those at the outside rather nearer the camera than the center ones; or, in other words, making the group somewhat into the form of a half circle, with its center farthest from the lens.

Coating the Lens with Yellow Dye

We had occasion to copy paintings in which there was association of blue tones with considerable yellow, and had great difficulty in the use of the yellow screen in conjunction with the orthochromatic plate. Although we tried placing it behind the lens, in front, and even as a diaphragm, still there was an undesirable want of sharpness in the image. We bethought ourselves of the plan employed by Captain Abney of coating the lens on two surfaces.

We tried first tumeric in collodion. Tumeric was placed (powdered) in alcohol and boiled. After settlement the clear part was added to the collodion. The image through this lens had a peculiar hue, which gave promise of good depression of the overactive rays, but, strange to say, the results, as far as color values were concerned, were scarcely better than with an ordinary rapid plate. We then coated the surfaces with aurine in collodion, and after the combinations were dry screwed them into their mountings. The results were everything to be desired (with a slow Iso plate).

It would seem, therefore, that mere yellowness is not the essential in depressing the overactive rays. One should study the character of the dye employed to improve the color.

Posing the Hands

Photographically speaking, though not scripturally speaking, the hands instead of the tongue might be considered unruly and incapable of being artistically tamed. Not to be disparaging to the charms of the fair sex, we are compelled to say we rarely see well-formed hands, and truly they obtrude themselves in such exaggerated proportions in photographs that it might perhaps be better to drop the subject as one of which the less said the better were it not that a well-formed hand on a man or a delicately formed hand on a woman is one of the prized perfections of nature's parsimonious hand-outs.

In sculpture, especially ancient sculpture, there is no dearth in beauty of presentation of this member of the human frame which characterizes man pre-eminently in the animal kingdom. Many a young artist finds his limitations in his artistic flights in his effort to adequately portray the complicated curves and graceful lines of a hand.

Nothing looks worse than a stiff, ill-posed, awkward hand. Of a truth the hand is an element in expression, giving as it were an index of character secondary only to the face. In photography the proper management of the hands is made doubly difficult, not only on account of the persistent way they will assert that awkwardness or self-consciousness, but also by reason of the exaggeration by reason of greater closeness to the lens. In order to counteract this natural—or unnatural it may be—obstacle it becomes necessary to keep the hands in a pose as close to the person as possible, and consequently there is a constant tendency to counteract any look of ease or grace and an inclination to stiffness and constraint.

The old portrait painters ran into certain conventionalities which make their works

in this particular monotonous and distasteful. Even Vandyke's hands are somewhat finical and overwrought—that is, characterless, especially his men's hands. We all remember the stereotyped plan of having one hand on a book which rests on the knees while the other hangs over the edge of a table, or with one grasping aimlessly the back of a chair, the other holding a scroll, and many other artistic tricks which the more independent moderns ignore altogether as artificial. Still, one hates to see the vulgar, commonplace, almost brutal, treatment of hands by some of our lauded portrait painters. It is almost too common a sight to call attention to the clumsy way some of our high-priced portrait painters dispose of the hands of their sitters, displaying them in their most awkward position and totally without refinement. Some painters make a sort of compromise, bribing, as it were, one hand to hide itself out of sight so that they may spend their artistic energy on the other. Perhaps they think in this way they may overcome the tendency to spottiness in the picture, a liability where both hands claim attention. Some of such devices of disposing of one hand show a good deal of ingenuity in bringing to their aid the drapery and hangings or parts of the apparel as a means of concealment. A frequent mode was to have one hand tucked beneath a partially unbuttoned coat, and during the period when the Spanish cloak was in fashion that garment found a ready means of hiding one hand at least.

The late Herr Dührkoop in some of his excellent photographic portraits showed how profusely he had studied the old masters in the management of hands. Sir Thomas Lawrence and Vandyke conscientiously sought to utilize the hands as artistic elements in their portraiture. They both introduced both hands boldly and often with telling effect. Vandyke, though, as we have remarked, inclined to be finical and too delicate in the treatment of hands, shows much skill in posing them and in making them seem initial parts of the human frame. However, we think we might safely say that no one gives us finer examples of hand-posing than Sir Thomas Lawrence.

His disposition of them is nearly always easy, natural, and in every way appropriate; that while they add greatly to the completeness and interest, they are not open to the objection of an uncalled-for display; nor do they detract anything from the interest which should center in the head and face.

Lawrence overcomes nicely the objection of presenting two spots of light, equally claiming our attention, and so distracting our artistic perception by placing one hand so disposed that it is much less conspicuous than the other, and sometimes he throws one hand entirely into shadow. This latter mode is one occasionally taken advantage of with good effect by photographers. When a head, for instance, is posed leaning upon one hand the effect is much improved if the hand be against the dark side of the face and thrown into shadow by the head, and when hands are not placed close together so as to make a group in themselves it is better to subdue one of them by shadow.

Whenever appropriate it is well to have the hands represented as doing something. Idle hands get artistically into mischief. If a hand is posed as entirely unoccupied it must be well posed, and if it does not happen to be a graceful or well-formed hand the attention is apt to be drawn to it more than one wants, and even if it is an elegantly formed member the picture is apt to give an impression of affection.

The more one manipulates the hands of his sitters the more liable he is to get into trouble.

When the fingers are extended stiff and straight out and held close together the effect is bad, and if kept straight and spread equally the result is sprawly looking. When the hand is open three fingers pose together better than two, and some of the fingers should be drawn up, but not all equally.

A bad arrangement is when the hand is held flat and the fingers doubled up to the second joint; this gives the look of a truncated hand. It is unwise to give any set directions for hand-posing, but we might say both hands hanging down by the sides never make a good pose.

In conclusion, by way of advice, we might say never call your sitter's attention to the hands; an awkwardness and unnaturalness is inevitable. Have you never noticed in photographs of groups, or even of individuals, where the object of the photographer is to get the group arranged or display some special feature (athletic build, perhaps) in the individual how very naturally and even artistically the hands are disposed? They were never thought of, and so left to their own free will they posed themselves.

Photographs by Wireless

Word comes from London, England, that at no distant date photographs will be sent by wireless from all parts of the world direct into the newspaper offices, according to the General Radio Company.

In the research laboratory at the company's works at Twyford Abbey photographs already have been received by radio and, though the invention has not yet gone beyond the experimental stage, remarkable results are stated to have been obtained.

Those who have seen the radiograph pictures say they are quite good and generally recognizable. Though the main criticism is that the clarity of the pictures leaves room for improvement, this, it is said, will be remedied in time.

The pictures which have been received by the General Radio Company were wirelessed direct on to a specially made sensitive celluloid film which afterwards was developed.

Debt of Astronomy to Photography

Photography has been truly called the handmaid of the sciences, however much she may have been degraded to the humble position of drudge to the fine arts; but few of us hardly realize the incalculable service the modern dry plate has rendered the astronomers.

There is no doubt of the great revival of astronomy since 1881. It has developed in every direction, and the revelations are so great as almost to make the thought of them depressing to humanity.

The advent of the dry plate about that year made it possible to apply photography freely in all astronomical work, and it must be acknowledged that its discovery is the chief cause of the great astronomical expansion.

Photography, to be sure, was applied to astronomical investigations before 1881, but only with difficulty and haltingly.

It was the gelatine dry plate which made long exposures possible, and thus enabled the astronomer to obtain regular records of family luminous objects, such as nebulæ and star spectra. Roughly speaking, the number of stars visible to the naked eye has been stated at eight thousand. Our telescopes of the best construction increase the number to some hundred millions. But the number which can be photographed is beyond calculation, and depends only on the length of exposure. The serious practical proposal to "chart the sky" by means of photography dates from this side of the year 1881.

The Paris Conference of Astronomers, in 1887, which made an international scheme for sharing the sky-mapping among eighteen observatories (since busy with the work and continuously giving out valuable results), originated with photographs of the comet of 1882 taken at the Cape Observatory.

Professor Pickering, of Harvard, did not join this co-operative scheme, but has devised methods of charting the sky very rapidly, so that he has at Harvard Observatory records of the whole sky many times over, and when new objects are discovered he can trace their history backwards for more than a dozen years by mere reference to his plates.

This is a wonderful new method—a mode of keeping record of present movements and changes which promises much for the future of astronomy.

By the photographic method hundreds of new variable stars and other interesting objects in the heavens have been discovered. New planets (asteroids) have been detected by the hundred.

Up to 1881 two hundred and twenty asteroids, or other dark planets, were known. Now a score, at least, are discovered every year.

One of these new planets, Eros, is particularly interesting, since it is nearer the sun than Mars, and gives a splendid opportunity for fixing with increased accuracy the sun's distance from the earth. Two new satellites of Saturn, and two of Jupiter, have yielded their impress to the receptive dry plate. One of the new satellites goes around Saturn the wrong way, thus presenting a problem for the adherents of Laplace's theory to solve. Perhaps it may upset all our previous ideas of solar systems, and this is due to the dry plate.

The introduction of photography has made an immense difference in spectroscopic work. The spectra of the stars have been readily mapped out and classified, and now the motions on the line of sight of faint stars can be determined. This motion in the line of sight, which could not be measured before photography furnished its aid, now provides one of the most refined methods in astronomy for ascertaining the dimensions and motions of the universe. It gives us velocities in miles per second, instead of a mere angular unit, to be inter-

preted (as formerly) by a very imperfect knowledge of the star's distance.

Visual observations were begun in 1875, but were found to be of little value on account of being affected by instrumental errors and the personal equation of the observer. The introduction of dry plates was the inauguration of the new and perfect way.

Among cther by-products of the method are the spectroscopic doubles, stars which we know to be double, and of which we can determine the period of revolution, though it is impossible to separate them visually, even with our most powerful telescopes.

Make Photo 10 Feet High, 96 Feet Long

A photograph ninety-six feet long and ten feet high, one of the largest ever made, is said to have been completed by Dr. Frank M. Woodruff, curator of the Chicago Academy of Sciences, in Lincoln Park, Chicago.

It shows a panorama of the Lake Michigan shore at Miller Beach, near Gary, Ind., the famous Indiana sand dunes, the sluggish Grand Calumet river, and the swamps and swale stretching around the eastern and southern environs of Chicago. The photograph is printed in natural colors.

The picture is one of four immense panorama photographs which, when all are complete, will form the backgrounds of exhibits showing the birds, animals, reptiles, trees and flowers common now or in earlier days in the Chicago region.

A second picture 72 feet long and ten feet high, has been completed, and two more, one 96 and the other 72 feet long, are to be made.

The photographs mark the advent of a new art and have displaced oil paintings costing thousands of dollars. A picture 92 feet long can be produced, according to Dr. Woodruff, for less than $100, and the tinting in transparent oils costs but a small amount additional, as compared with the heavy cost of oil paintings.

Photographic backgrounds, according to government ornithologists who recently inspected the pictures, mark a milestone in museum displays. Unlike the oil paintings formerly used, they are exact in every detail and the perspective is much better. The improved perspective blends the background into the foreground exhibit, and carries out the illusion of vast space.

Birds, animals, trees of special shape or anything else can be added to the background, Dr. Woodruff found, by enlarging their photographs to the right size, cutting out the picture, tinting it, and sticking it on with a pin. Birds in flight, of the same species shown among the stuffed foreground exhibits, are given the appearance of actual motion through space because the pin suspends them in front of the background, instead of their being a painted part of it.

In making the immense photographs Dr. Woodruff, who took all the original pictures himself, had to develop new methods and special equipment. The photographs are printed in ten or eleven foot sections, each section being the enlargement of one eight by ten negative. Developing papers in strips eleven feet long and forty inches wide is used, three strips being mounted on the printing board at a time. To keep all parts of such a large printing board in focus it was necessary to build it in a curve corresponding to an arc of the circle of which the enlarging camera is the center.

To develop the huge prints an immense tray is mounted on wooden horses and four extra-tall men drag the paper back and forth, while a boy wearing rubber boots climbs into the developer armed with a swab mounted on a broomstick handle and assists their efforts.

International Salon of the Pictorial Photographers of America

For many years there has been a demand for a representative Photographic Salon in New York—a demand logical, not merely from the location and size of the city, but also on account of its importance as an art and photographic center and as a magnet for country-wide visitors in search of what is newest and best.

With the institution of the Art Center and through its generous co-operation as a whole, the Pictorial Photographers of America, one of the founding and component organizations of that body, are enabled to announce an International Salon, to be held at the Galleries of the Art Center, 65 East Fifty-sixth street, New York City, throughout the month of May, 1923. These galleries are convenient of access and are located in what has come to be the artistic nucleus of the city; and furnish ample, suitable, well-lighted space for an exhibition, if the entries warrant, of several hundred prints.

Every effort will be made to secure representative foreign photography, but we are equally desirous of showing a large collection of the best American work. In view of the importance which naturally attaches to this event and which we shall aim in every way to signalize, we urge the early and earnest co-operation of all pictorial workers throughout the world.

The Jury of Selection will be announced in advance of the exhibition. Consideration of all pictures will be deliberate and impartial. Acceptance will be restricted to work combining high artistic excellence with perfection of technique.

It is probable that we shall also choose from the American section, the contents of our next annual, *Pictorial Photography in America, 1923.*

Entry forms, with precise data, will be distributed at an early date.

WM. A. ALCOCK, *Chairman,*
44 Wall street,
New York City.

G. W. HARTING, *Secretary,*
51 West Tenth street,
New York City.

Printing from Line Negatives

It is not too well known that gaslight paper shows marked superiority over bromide for the purpose of printing from line negatives. Not only does the slow paper give a pure black line with greater ease and latitude of exposure and development, but the gaslight class of emulsion has the property of retaining a perfectly clean edge to a line no matter how grossly over-exposed it may be. Bromide paper, on the other hand, irradiates to a slight but noticeable extent on the slightest provocation.

In many line negatives some parts are slightly veiled, and an exposure sufficient to give a good black in these portions would tend to thicken the clearer lines. In gaslight, provided proper contact is secured, this is never the case. Much the same remarks apply to the making of diagram lantern-slides, but here a word of caution is necessary. A negative which has portions showing a distinct veil proves difficult to print on a lantern plate of the gaslight variety without very prolonged exposures. Although the clearer lines do not actually thicken up by spreading any more than in a paper print, halation is very liable to occur owing to the great transparency of the emulsion.—*The British Journal of Photography.*

Toning Bromides with Ferri-Cyanide of Copper

Toning with copper ferri-cyanide is not new, but its use is not common, although probably few are aware of this easy means of obtaining a variety of pleasing tones on bromide paper. The results are similar to those obtained by the use of uranium.

The print to be toned should be developed, fixed and most thoroughly washed before application of the toning agent. If the hypo is not most thoroughly eliminated from the fiber of the paper, its combination with the toning salt will cause a reduction of the image to the extent of obliterating the detail in the shadows of the photograph. On placing the print in the toning solution a gradual change in color takes place, first to black, then warm brown, purple and finally deep red.

During the changes a slight diminution in density takes place, but unless the final red tones are desired it does necessitate over-development of the original print. When the proper tone has been reached the print is washed and dried. While several formulæ have been published, the following will be found most satisfactory:

Dilute the solution with water from 3 to 10 parts, as may be desired.

10 per cent citrate of potassium..	10	parts
10 per cent sulphate of copper....	1½	parts
10 per cent ferri-cyanide of potas.	1	part

The tones produced are pleasing and one avoids the unpleasant odor of the sulphuretted hydrogen from the sodium sulphite usually employed in bromide toning.

Metol Poisoning

Metol severely irritates the skin of some persons, and gives them so much trouble in using the standard developer that the cause and cure of the susceptibility have been much sought. Doctors are not able to say just what condition produces the susceptibility. Very many analogous actions are known. The common, but by no means universal, susceptibility to ivy poisoning is an example. Dusts or gaseous effluvia from animal and vegetable organisms are also frequent causes of irritation and even of serious disease. Hay fever is commonly ascribed to the pollen of some flowers, especially the ragweed. Unable to give a definite cause, the doctors employ a not uncommon method, namely, of inventing a special term. For many years it was customary to call the liability to these irritations "idiosyncrasy." Of late years

the term "anaphylaxis" has been much in vogue. Photographers are, however, but little interested in the terminology. Those who suffer from metol poisoning desire relief. Of course, the simplest and best method is to discontinue the use of the material or to use rubber finger cots. The following applications to prevent the effect are recommended by a contributor to the *British Journal of Photography*. After using the metol developer, the hands are soaked in hot water containing sodium carbonate in the proportion of 4 ozs. to the pint. The directions are that boiling water is used and the hands kept in until the water is cool, which is for about fifteen minutes. It is obvious, however, that the hands cannot be immersed in boiling water or in any that is materially above 100° Fahr. After the soaking, the hands are dried and anointed with a mixture which has already been recommended in *B. J.*

Ichthyol	10 minims
Lanolin	40 grains
Boric acid	40 grains
Vaselin	30 grains

This is to be rubbed into the affected surfaces three times daily. The recommender of the above method also finds advantage in using a mixture of 1 pint of water and 20 drops of hydrochloric acid. in which the hands are rinsed before and after the use of the metol developer. It seems that the use of rubber finger cots would be a simpler method than these complicated methods.

Desensitizing in the Autochrome Process

In a paper read before the Photo-Club of Alsace and Lorraine, M. Eugène Muller has some hints to give from his experience in the use of desensitizing in the Autochrome process. He writes:—

As is well known, the reddish color of gelatine film obtained by the safranine desensitizer is destroyed by the permanganate reversing bath. On the other hand, this color is not removed when a reversing bath of acid bichromate is used. Those who have been accustomed to use the bichromate reverser do not seem to take kindly to the permanganate reverser, which they consider less practical. They are thus led to discard the safranine desensitizer and to use the aurantia desensitizer for Autochrome plates. While the yellowish color produced on an Autochrome plate by aurantia is not destroyed by the acid bichromate bath itself, washing for 2 to 2½ minutes after the reverser is sufficient to remove the yellow color.

The panchromatic emulsion of the Autochrome plate being only about half the sensitiveness of the Lumière Blue-Label plate, the degree of desensitization obtained with aurantia is ample for development quite close to a 16-c p. carbon-filament bulb used behind four thickness of yellow Virida paper. With this illumination there is no risk in examining the plate by transmitted light. Holding it 8 or 10 inches from the light, the instant of "extinction" of the image can be seen as readily as by green light.

In practical working, the plate is placed in the desensitizing bath in complete darkness, after which the yellow light can be immediately used, if the precaution is taken of using for desensitizing an opaque dish (porcelain or xylonite) and covering it with a card or placing it in shadow. The protection of a shadow of a solid screen is sufficient for the transference of the desensitized plate into the developer. Working in this way, the handling of the plate in the dark is reduced to a minimum. The darkroom clock can be placed in the direct light of the lamp, so that it can be used with the greatest ease for timing both the period of desensitizing and the factorial development of the plate.

In transferring the plate from the desensitizing bath directly into the developer without rinsing, the latter becomes strongly colored, but this color does not prevent the solution from being used for the second development, even when exposure of the plate is made to electric light such as a 32- or 50-c.p. lamp. It is, however, advisable to expose the plate to the light for some seconds before applying the colored developer and to rock the dish vigorously so as to uncover the various parts of the plate to the artificial light, or to daylight if that is used, during re-development.

It will thus be seen that when re-developing desensitized plates it is not necessary to use a stronger illumination than when re-developing plates which have not been desensitized. Apparently this arises from the fact that, as noted by Lüppo Cramer, desensitization acts only on the surface of the emulsion grain, and that these surface grains are removed by the reversing bath.—EUGENE MULLER in *The British Journal of Photography*.

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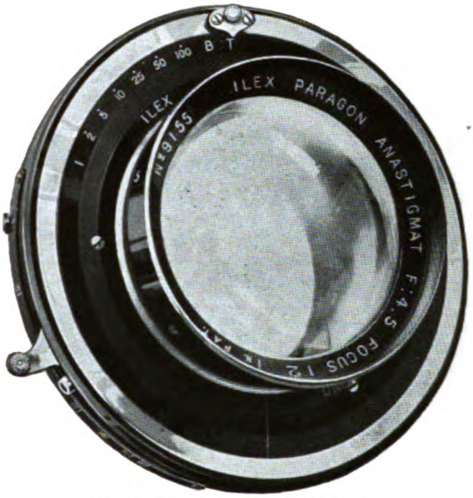

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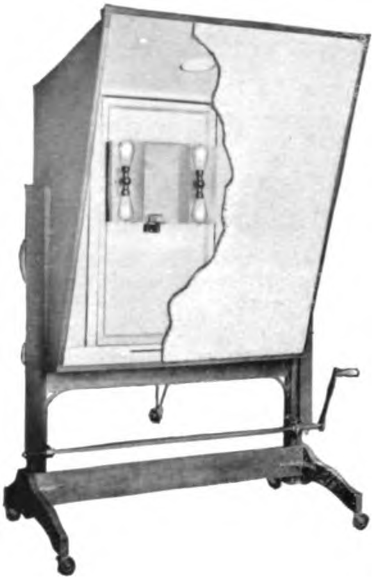

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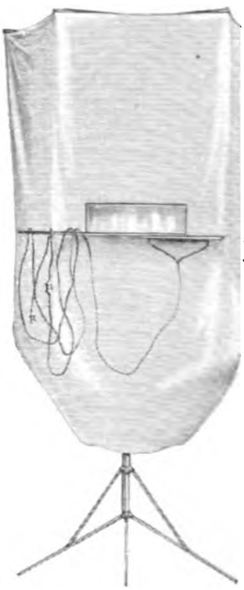

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